

Flathead County

Hog Heaven

Flathead Mine

PA # 15-012

Gallatin County

Bozeman

Elk Creek Corundum
Thumper Mica
Karst AsbestosPA # 16-013
PA # 16-015
PA # 16-018**Granite County**

Alps

Alps

PA # 20-065

Antelope Creek

Silver King
Lori No. 13
AntPA # 20-186
PA # 20-191
PA # 20-194

Combination

Combination

PA # 20-009

Dunkleburg

Forest Rose
Wasa
Jackson ParkPA # 20-004
PA # 20-023
PA # 20-027

Maxville

Maxville Tails (Londonderry)

PA # 20-209

Moose Lake

Banner
Old DominionPA # 20-175
PA # 20-180

Philipsburg

Bi-Metallic/Old Red
Douglas Creek Tailings
Algonquin
Rumsey Mine and Millsite
Scratch All
Trout
Granite Mountain
True FissurePA # 20-002
PA # 20-003
PA # 20-005
PA # 20-018
PA # 20-019
PA # 20-062
PA # 20-110
PA # 20-111

South Boulder

Nonpareil
BrooklynPA # 20-012
PA # 20-025MONTANA STATE LIBRARY
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MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: FLATHEAD MINE COMPLEX PA#: 15-012

Date: August 5, 1993 Time:

Field Team Leader: Bullock/Tuesday; Pioneer

Sampling Personnel: Belanger, Flammang, Clark;
Pioneer

Visitors: None

Weather/Seasonality Observations: Sunny; slight breeze; warm
(70°); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #5: WR-12 at lower
tailings; #16, #17: Upper dumps (WR-4 and WR-5); #24: Flathead mine
workings from top; #25: Cavern-like stope near top; #26: Stope #4
and Cavern #2; #27: Adit #1 and #2; #28: Adit #3; #29: WR-3
(orange) in lower part of picture and WR-4 (tan) in upper part of
picture; #30: Buildings of WR-1; #31: WR-2 from top of WR-1, facing
south. The following are from West Flathead Mine: #32: WR-10 with
loadout; #33: WR-9 and Adit #3; #34: Adit #2 and WR-8; #35: WR-7
and Adit #1; #36: GW-2 sample location taken from end of pipe; #37:
WR-6. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Samples taken from West Flathead Mine were taken at the same time
as this site and were submitted under this PA Number. The Ole Mine
may have been included in the West Flathead sampling and the Martin
Mine may have been sampled as WR-12 and Tailings Pond. This site
is also known as the Hog Heaven Mine.
Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Isolate the
creek from mine wastes; potential exists for reprocessing waste
rock. Grade, amend, and revegetate waste rock dumps. Highwall
reduction and run-on control should also be considered.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): FLATHEAD MINE COMPLEX PA#: 15-012

Legal Description: T 25N ; R 23W ; Sec. 17&18 , 1/4 1/4 1/4

County: FLATHEAD Mining District: HOG HEAVEN

Latitude: N 47° 55' Longitude: W 114° 34'

Primary Drainage Basin and Code: Sullivan Creek/17010212

Secondary Drainage Basin: Sullivan Creek

USGS Quadrangle map name(s): Koffard Ridge

Mine Type/Commodities: Hardrock/Silver, Gold, Lead

Activity Status: Active , Inactive/Exploration X , Abandoned .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Hecla Mining Co., 6500 Mineral Drive, Coeur d'Alene, ID 83814.

Relationship to other mines/sites in the area/district: Other mines in the area include: Ole, Battle Butte, Martin, Mary Ann, and Birdseye; all are epithermal hot springs deposits. The Mary Ann Mine is located east-southeast on a ridge from this site.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? The site is listed under CECRA.

General site features: Elevation Flathead, 3880'-4300'; West Flathead, 3600' , Slope Flathead, 25°; West Flathead, 5° , Aspect Flathead, South and Southwest; West Flathead, West and East

Land use: Mining X , Recreational , Residential , Urban , Agricultural X , Other (Specify)

Area of disturbed/unvegetated lands? 23/6.5 acres.
Dimensions: Flathead, 2,000 feet x 500 feet/West Flathead, 800 feet x 350 feet

Predominant vegetation types: Ponderosa pine, Douglas fir, cottonwoods

Access: roads - good , poor , 4wd X , trail .
Other logistical considerations (proximity to other sites). West Flathead Mine is just off of the road leading to Flathead Mine; there is a gate at the base of the road leading to the mines.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Flathead Mine lies in a dry drainage of an unnamed tributary to Sullivan Creek. Water leaving the site would flow southwest to confluence with Sullivan Creek 1/2 mile away. West Flathead Mine lies on the Sullivan Creek drainage. Sites are underlain by rhyolitic volcanic rocks underlain by Ravalli group of Precambrian belt rocks.

Mining/milling history, ore type/tenor, host rock, gangue: Mining began in 1928; large-scale mining ceased in 1946 and has been sporadic since that time. Production from 1928 to 1930 was 20,000 tons of ore producing 1,500,000 oz. Ag with some Pb and Au. By 1975, 373,759 tons of ore were removed from both Flathead and West Flathead with 8,812,544 oz. Ag recovered. West Flathead Mine was located in 1941. Deposition of minerals are associated with epithermal volcanic, derived hot spring activity with mineralization occurring in fumarole holes and veins. Primary sulfide minerals are pyrite, galena, antimonial, matildite, pyrrargyrite, enargite, sphalerite, native silver, and marcasite. Also present in the fumarole holes are clay (iron-rich berdelite) and abundant barite and alunite.

Mine Operation?

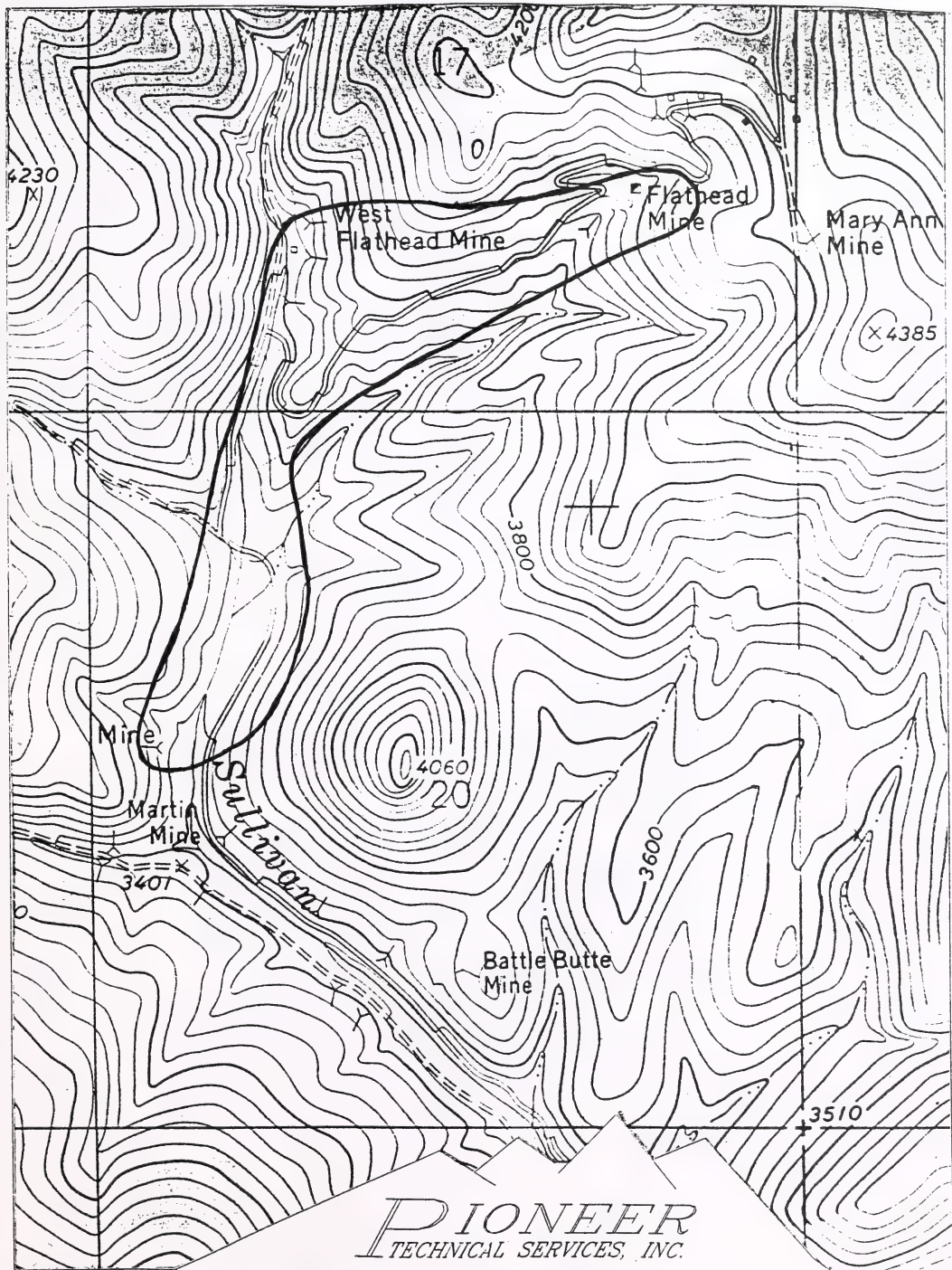
Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 15, Comment 9 at Flathead; 5 at West Flathead; 1 collapsed by tailings (WR-12)
Pits - Yes X, No , # 1, Comment Assoc. with loadout at Flathead
Placers - Yes , No X, # , Comment
Other - Yes X, No , # 5, Comment Stopes

Mill Operation? Yes X, No . If yes answer the next three questions:

Period(s) of Operation: Tailings were identified below West Flathead Mine in Sullivan Creek drainage; no information on period of operation.

Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and names of mines that supplied mill feed: Unknown

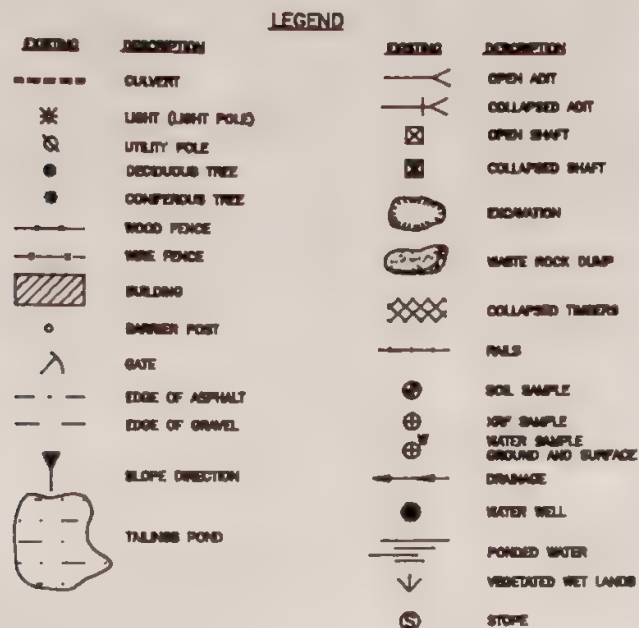
Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? Unknown



FLATHEAD MINE, P.A. NO. 15-012

T25N, R23W, SECTIONS 08, 17

SCALE: 1" = 1000'

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

FLATHEAD MINE PA# 15-012
HOG HEAVEN DISTRICT FLATHEAD COUNTY

DRAWN _____ JTP DATE 1 DEC 93
DESIGNED _____ TPR DB NO. 93-17
APPROVED _____ NUB F.B. NO. _____

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
MONTANA
WASHINGTON
GREAT FALLS-BOZEMAN-KALISPELL
SPOKANE

Hot

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
100% fine sand

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): TP-1 is white sand to 2 feet, then gray sand; maximum depth is 3 feet. TP-2 has no stratification and a maximum depth of 1 foot.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Mostly dry; some moist sand in TP-2.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Breached

Comments on potential for mitigation: Remove or isolate from drainage; place in repository or stabilize using cap or amendments.

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Tuesday, Flammang, Belanger*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAIN- MENT	PH SU (D/S)*	RADIO- ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	10,000	Southern most waste rock in drainage at Flathead Mine; west lobe, off end near top	None	4.6 (D)	0.045	15-012-WR-1	08/05/93 1440	T-Metals, ABA
WR-1B	WR		East lobe on west side	None	< 3.5 (D)	0.055			
WR-1C	WR		East lobe on east side	None	< 3.5 (D)	0.06			
WR-2A	WR	9,000	Waste rock below buildings at Flathead Mine; east end near top	None	< 3.5 (D)	0.045			
WR-2B	WR		Near middle on top	None	< 3.5 (D)	0.05			
WR-2C	WR		On lobe above Adit #1	None	< 3.5 (D)	0.065			
WR-2D	WR		West end near top, pile below buildings	None	6.6 (D)	0.04			
WR-3A	WR	20,000		None	6.2 (D)	0.04	15-012-WR-2	08/05/93 1850	T-Metals, ABA
WR-4A	WR	8,500	East end of WR-4 at Flathead Mine	None	6.6 (D)	0.04			
WR-5A	WR	22,000	Flathead Mine	None	5.7 (D)	0.05			
WR-5B	WR			None	5.2 (D)	0.04			
WR-5C	WR			None	6.6 (D)	0.05	N/A	N/A	XRF Analysis
WR-6	WR	1,500	North end of West Flathead Mine; second level on northwest end	None	6.4 (D)	0.035	15-012-WR-3	08/05/93 1720	T-Metals, ABA
WR-7A	WR	12,000	Pile assoc. with highwall at West Flathead Mine; south lobe off west side near top	None	< 3.5 (D)	0.09			
WR-7B	WR		West end of lobe north of WR-7A	None	4.95 (D)	0.05			

*Blank reading (factory meter); S-Saturated Paste (Oxide Meter)

Comments or deviations from SOPs: 15-012-WR-1 is composite of WR-1A through -1C, and WR-2A through -2D. 15-012-WR-2 is composite of WR-3A, WR-4A, and WR-5A and -5B. 15-012-WR-3 is composite of WR-6, WR-7A and -7B, WR-8, and WR-10B.

*Continued on next page

SOURCE INVENTORY FORM (Cont'd)
SAMPLERS: Bullock, Tuesday, Flammang, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-8	WR	4,800	South of WR-7 at West Flathead Mine; west end	None	3.55 (D)	0.04			
WR-9	WR	80	Southern most pile on east side of creek at West Flathead Mine; off knob on west side	None	< 3.5 (D)	0.07	15-012-WR-4	08/05/93 1730	T-Metals, ABA
WR-10A	WR	500	Large pile on west side of creek at West Flathead Mine; south end, south of loadout	None	2.76 (S)	0.06			
WR-10B	WR		Near middle on east side	None	< 3.5 (D)	0.04			
WR-11	WR	1,200	Above WR-10 at West Flathead Mine; east side near top	None	NM	NM			
WR-12	WR		675 feet northwest of tailings on west side of wetlands at West Flathead Mine	None	4.6 (D)	NM	N/A	N/A	XRF Analysis
SS-1	BKGRND	N/A	Background soil	N/A	N/A	N/A	15-012-SS-1	08/05/93 1555	T-Metals
TP-1A	TAIL	275	Near center of north pond at West Flathead Mine; 0-9", yellow sand	Breached Dam	< 3.5 (D)	0.02	15-012-TP-1	08/05/93 1530	T-Metals, ABA, Mechanical, Cation
TP-1B	TAIL		9-24", white sand	Breached Dam	4.9 (D)	0.03			
TP-1C	TAIL		24-36", gray sand	Breached Dam	< 3.5 (D)	0.03			
TP-2A	TAIL	250	Northeast corner of south pond at West Flathead Mine; three holes, yellow sand	Breached Dam	NM	NM			
TP-2B	TAIL		Southwest corner; one hole, white sand	Breached Dam	4.2 (D)	NM			
TP-2C	TAIL		Southeast corner; two holes, gray sand	Breached Dam	< 3.5 (D)	NM			

D-Direct reading (falsey Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 15-012-WR-4 is composite of WR-9, WR-10A, and WR-11. 15-012-TP-1 is composite of TP-1A through -1C, and TP-2A through -2C. NM = Not Measured

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No , Number: 3 Identification: Three adits on level with building at Flathead Mine

Filled shafts: Yes , No X, Number: Identification:

Seeps/Springs: Yes X, No , Number: 1 Identification: Possible artesian well or adit discharge with Flathead Mine

Groundwater wells within 4 miles?: Yes X, No ;

Number of well logs: 1

Distance to nearest well used for drinking? Approx. 2.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable X, Possible , Unlikely .

Discharges have iron precipitate at exits. Large volumes off waste rock contain elevated metal values.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Sullivan Creek flows past the tailings. Also, due to discharge, there is water in drainage through West Flathead Mine.

Dry streambeds: Yes X, No , Name(s): Dry drainages at Flathead Mine; Sullivan Creek is dry above and below West Flathead Mine.

Other surface water: Yes X, No , Name(s)/Description: Standing water on WR-2 due to adit discharges.

Waste materials within any floodplain: Yes X, No Source ID(s): Waste rock associated with Flathead Mine is in Sullivan Creek drainage.

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)?
High Flow: 1.0 cfs, Average Flow: < 0.1 cfs

Distance between waste source(s) and nearest surface water body (ft)?
Sullivan Creek flows along toe of WR-10.

Surface water draining onto or through waste sources: Yes X, No ,
Describe: Small amount of water ponded on WR-2 at Flathead Mine due to adit discharge.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Stock watering, irrigation, wetlands

Observed erosional/sedimentation/stream turbidity problems? Yes X, No , Distance downstream (ft)? 500 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Erosion of waste rock off of WR-1 at Flathead Mine is present in dry drainage for at least 160 feet. Iron-stained rocks present in Sullivan Creek drainage for 500 feet.

SAMPLERS: Bullock, Belanger

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No water in Sullivan Creek above or below the West Flathead Mine.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Large area below West Flathead Mine; approx. 10 acres north and east of tailings

Wetlands present: Yes X, No , Describe: Below West Flathead Mine where Sullivan Creek reappears; east of tailings

Carbonate rocks/soils: Yes , No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 X; 30-100 ; 100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ; Comments

Nearest residence(ft or miles)? Approx. 2.5 miles (part-time recreational residence adjacent to the Mary Ann Mine)

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM
SAMPLERS: Bullock, Tuesday, Flammang, Belanger

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/NO DEBRIS/LOW/NONE)
WR-1	FEOX; SO3; Low pH	Dry	28,800	28,800	Yes	Low
WR-2	FEOX; SO3; Low pH	Dry	38,700	38,700	Yes	Low
WR-3	FEOX	Dry	108,000	108,000	Yes	Low
WR-4	FEOX	Dry	37,800	37,800	Yes	Low
WR-5	FEOX	Dry	117,000	117,000	Yes	Low
WR-6	None	Dry	36,000	36,000	Yes	Low
WR-7	Low pH; SO3	Dry	40,500	40,500	Yes	Low
WR-8	Low pH; FEOX	Dry	16,200	16,200	Yes	Low
WR-9	Low pH	Dry	450	450	Yes	Low
WR-10	Low pH; SO3; FEOX	Dry	9,900	9,900	Yes	Low
WR-11	SO3	Dry	6,550	6,550	Yes	Low
WR-12	Low pH; SO3	Dry	1,100	1,100	Yes	Low/Moderate
TP-1	Low pH	Dry	2,475	2,475	Yes	Low
TP-2	Low pH	Dry	1,600	1,600	Yes	Low
GW-1	FEOX; Low pH	N/A	N/A	N/A	N/A	N/A
GW-2	FEOX	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes ☐, No ☒, Describe: _____

Population within 1 mile: 1-10 ☐; 10-30 ☐; 30-100 ☐; 100-300 ☐; 300-1,000 ☐; 1,000-3,000 ☐; 3,000-10,000 ☐; 10,000 or greater ☐; Comments None

Evidence of recreational use on site: Yes ☐, No ☒, Describe: _____

Accessibility - Fences, warning signs, closed roads? Locked gate at road leading into West Flathead and Flathead mines; "Keep Out" signs on locked adit.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes ☐, No ☒, Comment _____
Wilderness Area - Yes ☐, No ☒, Comment _____
T&E Species Habitat - Yes ☒, No ☐, Comment Grizzly, Peregrine
Bat Habitat - Yes ☐, No ☒, Comment _____

Primary Drainage ☐; Secondary Drainage ☒; No Information ☐:

Riparian Habitat Quality - High ☐, Medium ☒, Low ☐
Wetlands Frontage - High ☒, Medium ☐, Low ☐
Fisheries Habitat and Species Classification - 1
Sport Fishery Classification - 3

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes ☒, No ☐, Number 15, types and locations: Five open adits at West Flathead Mine; five open stopes at Flathead Mine; six open adits at Flathead Mine, one with a locked gate and three of which have been boarded up but the boards are collapsing.

Hazardous structures: Yes ☒, No ☐, Number 8, types and locations: Directly associated with the mine; several more cabins up by the Mary Ann Mine

Unstable highwalls, pits, trenches, slopes: Yes ☒, No ☐, Number 4, types and locations: Highwalls associated with WR-7 and WR-8 at West Flathead Mine.

Unstable waste piles, impoundments, undercut banks: Yes ☒, No ☐, Number 4, types and locations: WR-4, WR-5, and WR-2 are very steep and along a hillside; surface of WR-2 is collapsing into underlying adits and is very hazardous.

Fire and/or Explosion hazards: Yes ☐, No ☒, Explain: _____

Bibliography

- Jepson, Wayne Eric, Lateral and Vertical Zonation of Clay Minerals and Associated Alteration Products at the Hog Heaven Mine and Ole Hill Deposit, Hog Heaven Mining District, Flathead County, Montana, Thesis Written for University of Montana, 1993.
- MBMG, Geology and Mineral Deposits of Lincoln and Flathead Counties, Montana, Bulletin 79, Written by W.M. Johns, 1970.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Flathead Mine, Not Inventoried.
- MDSL/AMRB Files, Baseline Evaluation of the Aquatic and Terrestrial Ecosystems Potentially Impacted by Mining in the Vicinity of the Flathead Silver Mine, Hog Heaven Hill Mining District, Montana, Report Prepared for Congdon and Carey Company, Written by C.C. Gordon, Project Director, et.al., December 1, 1977.
- MDSL/AMRB Files, Hog Heaven Hill Mining District Water Quality Supplement, Written by C.C. Gordon, et.al., 1978.
- USGS, Topographic Map, Koffard Ridge, Montana, 7 1/2 minute Quadrangle, 1964.

LABORATORY ANALYTICAL DATA

FLATHEAD MINE COMPLEX
PA NO. 15-012

Flathead Mine PA# 15-012
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 08/05/93
Page 1 of 2.

SOLID MATRIX ANALYSES

Results per dry weight basis

Metals in soils

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
15-012-SE-1	20 J	262	9.05	13.3	5.52 U	21.4	11700	0.243	1520	10.2 U	48.1	24.8 U	1270	NR
15-012-SE-2	15.4 J	70.9	0.54 U	2.03 U	1.43 U	26	13100	0.031	64.3	2.65 U	27.1	6.43 U	80	NR
15-012-TP-1	160 J	711	12.2	1.78 U	1.87 U	348	15800	1.58	3.19	2.32 U	3330	130	3470	NR
15-012-WR-1	310 J	1000	5.94	1.96 U	1.38 U	116	22800	1.91	72.5	2.56 U	3460	125	2070	NR
15-012-WR-2	778 J	2160	2.85	1.57 U	1.1 U	84.7	20600	6.1	30.7	2.05 U	16500	114	201	NR
15-012-WR-3	134 J	89.1	1.12	1.66 U	1.87	34	13800	0.734	92	2.16 U	1700	89.3	119	NR
15-012-WR-4	3690 J	82.4	21.3	6.03	1.94	5760	139000	1.84	12.1	5.77	21100	438	2030	NR
BACKGROUND	7.17 J	283	1.28	4.96	3.23	9.38	14100	0.046	1220	5.12	20.7	5.23 U	149	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR U/1000g	ACID BASE POTENTIAL U/1000g	NEUTRAL POTENTIAL U/1000g	SULFUR ACID BASE POTENTIAL U/1000g	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENTIAL U/1000g	SULFUR ACID BASE POTENTIAL U/1000g
15-012-TP-1	1.89	59.0	-3.55	-62.6	0.25	1.37	0.27	0.27	42.8	-46.3
15-012-WR-1	3.00	93.7	-5.49	-99.2	0.57	1.12	1.31	1.31	35.0	-40.5
15-012-WR-2	1.62	50.6	-2.23	-52.8	0.77	0.06	0.79	0.79	1.87	-4.11
15-012-WR-3	0.86	27.0	-1.51	-28.5	0.35	0.30	0.21	0.21	9.37	-10.9
15-012-WR-4DUP	25.3	791	-5.35	-796	<0.01	12.1	15.1	15.1	378	-384
15-012-WR-4	25.6	796	-5.21	-803	<0.01	11.8	15.4	15.4	367	-373

Cation Exchange Capacity

FIELD ID	milliequivalents/100g
15-012-TP-1	0.63

Mechanical Analysis and % Coarse Material

FIELD ID	% clay	% sand	% silt	% coarse material (>2mm)
15-012-TP-1	6	54	40	0
15-012-TP-1D	6	52	42	0

Flathead Mine PA# 15-012
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 08/05/93
Page 2 of 2.

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
15-012-GW-1	102 J	13.9	1710	187 U	6.83 U	1170	71800 J	0.310 JX	6060	121	826 J	73.6	62300 J	793
15-012-GW-2	32.6 J	16.5	257 U	9.7	7.63	1.55 U	15100 J	0.220 JX	4040	12.7 U	3.79 J	30.7 U	4830 J	94.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
15-012-GW-1	2200	7.7	1320	1.9	NR
15-012-GW-2	292	< 5.0	162	< 0.05	NR

LEGEND

SE1 - Sullivan Ck. downstream from Flathead & W. Flathead areas
SE2 - Sullivan Ck. upstream from the W. Flathead area
TP1 - Composite of subsamples TP1A, 1B, 1C, 2A, 2B, and 2C.
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, 2B, and 2C.
WR2 - Composite of subsamples WR2A, 4A, 5A, and 5B.
WR3 - Composite of subsamples WR6, 7A, 7B, 8, and 12B.
WR4 - Composite of subsamples WR9, 10A, and 11.
BACKGROUND - From the Flathead Mine (15-012-SS-1).

GW1 - Flathead Mine western adit assoc. w/ WR2
GW2 - West Flathead Mine from pipe at mine

XRF ANALYSIS RESULTS

**FLATHEAD MINE COMPLEX
PA NO. 15-012**

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
15-012-SS-1		19425.4	12793.8	1866.65		1537.76	18490.4			201.239	56.5527 *	834.891
15-012-TP1-A		1247.4	1104.15	2509.87			6080.61		69.1161 *	2608.6		1795.98
15-012-TP1-B		1030.2	1068.73	2487.57			4478.23			2631.11		1684.17
15-012-TP1-C		411.678 *	1071.21	3023.04			17056.5		96.0839 *	4593.48		1821.44
15-012-TP2-A		1551.83	1127.61	1415.28	178.514 *		7226.32		148.757 *	57.8542 *	487.192	1113.56
15-012-TP2-B		769.781 *	942.345	1417.68			771.65				88.4393	757.09
15-012-TP2-C		1432.08	1234.18	1795.68			17256.9		2032.58	108.695 *	723.776	965.343
15-012-TP-1-COMP		1485.18	1270.28	2316.65			11187.6		244.018	2289.99		1330.25
15-012-WR10-A		1175.21	1469.28	1228.77			74859.2	900.901 *	5033.16	2875.37	4082.61	1141.14
15-012-WR10-B		29289.9	1767.35	1338.51			12631.5			100.093 *		345.166
15-012-WR1-A	460.768 *	15214.3	3154.68	1550			35740.6		215.549	495.892		1715.73
15-012-WR1-B		19075.9	1507.64	1128.61	195.334 *		21981.9		304.683	718.359		1165.08
15-012-WR1-C		28592.3	2470.18	903.166			10970.3		202.156 *	192.896		729.468
15-012-WR2-D		9018.42	1678.04	972.449			40660.8			282.92		2148.37
15-012-WR2-A		26241.2	2610.26	1932.66			21502			446.836		1270.23
15-012-WR2-B		25408.5	1489.57	1067.57	230.688 *		9524.47		45.2626 *	386.304		1000.96
15-012-WR2-C		23177	1398.11	1240.04	155.374 *		21727.5			228.9	246.469 *	568.916
15-012-WR3-A		9409.61	1835.8	1074.67			28837.8		130.502 *	382.852		1773.91
15-012-WR4-A	631.275 *	3945.72	1428.25	1202.38			29014.5		96.2872 *	149.025 *		2040.45
15-012-WR5-A		18429.1	3788.89	1202.62	233.751 *		20949.9		152.714 *	308.504		994.466
15-012-WR5-B		19620.9	1873.42	1893.66			22837.2			342.442		1048.39
15-012-WR5-C	506.053 *	9667.18	3456.87	3249.83			62872.7		55.2483 *	161.789 *		6345.5
15-012-WR7-A		5044.74	1435.28	1820			28003		124.665 *	199.061	348.617 *	1098.3
15-012-WR7-B		32047.9	1640.11	2381.43	160.698 *	275.221 *	14359.2			202.529		963.569
15-012-WR-11	399.869 *	11920.5	1052.43	1538.95			45801		166.817 *	2427.7		675.647
15-012-WR-12		21069.6	3048.39	1181.6	164.581 *	696.101 *	29935.6			123.232 *	58.3015 *	605.35
15-012-WR-1-COMP		24269.5	2328.31	1800.73			22393.5		128.525 *	367.413		1278.92
15-012-WR-2-COMP		12179.7	1964.04	1638.6	392.086 *		26433		94.6297 *	313.655		1504.5
15-012-WR-3-COMP		25202.3	1893.1	2180.4			22480.7	234.372 *	72.3044 *	168.511		764.4
15-012-WR-4-COMP		2541.3	1333.04	891.377			62523.2	711.181 *	5145.77	1608.44	4113.85	1301.86
15-012-WR-6		20483.8	1771.24	2030.9		298.136 *	32422.8		63.4503 *	170.245		449.171
15-012-WR-8		25782.5	1610.52	2046.67			19399.2		55.8485 *	301.138		865.154
15-012-WR-9		1348.14	1538.55	613.179			59327.3	631.517 *	7307.62	433.569	5779.19	1530.19

XRF Field Analyses

Results in PPM

Page 2 of 2.

XRF SAMPLE ID	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
15-012-SS-1	219.018				91.0141			1220.79	91.5776 *	31.4862 *	40.6979
15-012-TP1-A	289.392			4386.91	11.1088 *		54.7286 *	432.359		15.3633 *	52.9589 *
15-012-TP1-B	313.686			4164.15			67.6879 *	378.685	120.412 *	47.0789 *	47.0496
15-012-TP1-C	291.87	32.0916 *		3404.89			327.014	327.014	130.452 *	43.1745	69.3152
15-012-TP2-A	240.889			408.685			723.341	7767.13	166.781 *	55.3927	55.6537
15-012-TP2-B	287.851			32.2734 *			192.289	892.275	91.5837 *	21.3641 *	47.2813
15-012-TP2-C	236.217			68.244			683.076	695.354	108.785 *	23.252 *	81.3361
15-012-TP1-COMP	282.025			2184.06	78.8562		261.62	1455.9	120.782 *	26.0055 *	37.1563
15-012-WR10-A	136.467		10.9607 *	11485.8	242.896		597.986	1507.05	103.834	231.403 *	67.4389
15-012-WR10-B	170.626		10.9478 *	492.014	79.8033		483.057	1267.3	181.905 *	36.3973 *	75.2443
15-012-WR1-A	241.581			9654.2			176.501	15535.1	201.826 *	28.236 *	49.9484 *
15-012-WR1-B	120.541			3793.66	170.961			1450.77	114.423 *	27.0993 *	40.1036
15-012-WR1-C	199.774			404.069				1836.29	96.3725 *	30.9134 *	51.0437
15-012-WR2-D	204.31		11.1717 *	8941.99					123.055 *	16.3412 *	34.0167 *
15-012-WR2-A	220.372			1954.74	127.886		381.468	12022.9	399.755	184.879	184.879
15-012-WR2-B	160.63			1729.31	185.983		61.3947 *	3993.22	142.549 *	40.6444 *	39.0841 *
15-012-WR2-C	167.034			681.25	174.932		39.7281 *	1869.73	106.537 *	212.003	79.8524 *
15-012-WR3-A	204.739			6738.58	15.7573 *	121.472 *	54.4778 *	2573.52	367.644 *	18.761 *	48.9579 *
15-012-WR3-A	207.339			23874.7	134.668		239.857	6450.41	1399.88	32.8681 *	44.9821
15-012-WR4-A	124.356		26.9856 *	13273.4	86.7493		519.276	26393.7	112.158 *	15.5078 *	62.2003
15-012-WR5-A	179.14			11555.4	142.944		70.1941 *	8705.95	191.517 *		
15-012-WR5-B	217.25			21774.4	31.2332 *		114.838 *	8227.49	116.687 *		
15-012-WR5-C	350.309			3592.58	131.445		472.158	6197.27	221.436 *		
15-012-WR7-A	273.634	62.7028 *	30.7186	2383.43	175.279		565.263	345.21	371.107		
15-012-WR7-B	246.592			19657.8	77.7797		58.5257 *	815.38	356.332 *		
15-012-WR11	239.81	48.4055 *	7.01924 *					1823.04	322.008		
15-012-WR12	233.969		7.1568		137.99				289.217 *		
15-012-WR1-COMP	200.98			4261.22	111.619		167.956 *	5989.98			
15-012-WR2-COMP	159.902			13980.7	115.269		224.816 *	14287.6			
15-012-WR3-COMP	238.681		9.23326 *	2339.56	115.269		183.305	840.114			
15-012-WR4-COMP	121.687		7.09304 *	7952.01	65.2109		417.642	804.693			
15-012-WR6	227.596		13.5182 *	2016.64	133.701		200.789	653.719			
15-012-WR8	262.688			2500.65	174.009		119.323 *	987.948			
15-012-WR9	82.7473		8.1918 *	3704.6	47.9139	175.535 *	398.059	310.364			

* - Estimated Quantity

\$ - Unvalidated Data

**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**FLATHEAD MINE
PA NO. 15-012**

AIMSS SCORESHEET

SITE NAME: FLATHEAD MINE COMPLEX
PA NUMBER: 15-012

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6			610.773
7	GW - TARGETS	WELLS - 1 MI. x 2.5	0.0
8		WELLS - 1 TO 4 MI	1
9		NEAREST WELL	0
10		TARGETS SCORE	LINES 6 + 7 + 8
			1.0
		GROUNDWATER SCORE	LINES 4 x 5 x 9
			244309
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD	EXCEEDENCES	0
13A	OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16			669.321
17		DRINKING WATER POP'N	0
18		IMPACTED DRAINAGE	1
19	SW - TARGETS	WETLANDS	10
20		FISHERY	20
21		RECREATION	0
22		IRRIGATION/STOCK	2
23		T & E SPECIES HABITAT	5
24		TARGETS SCORE	SUM LINES 16 - 22
			38
		SURFACE WATER SCORE	LINES 14 x 15 x 23
			17803939
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD	CONTAINMENT	10
26B	OF RELEASE	DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29			19.975
30		POPULATION - 4 MILES	10
31	AIR - TARGETS	NEAREST RESIDENCE	0
32		WETLANDS	10
33		PARKS / WILDERNESS	0
34		T & E SPECIES HABITAT	5
35		TARGETS SCORE	SUM LINES 29 - 33
			25
		AIR PATHWAY SCORE	LINES 27 x 28 x 34
			24969
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	0
37A	LIKELIHOOD OF	ACCESSIBILITY	5
37B	EXPOSURE	DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40			18.233
41	DIRECT CONTACT	POPULATION - 1 MILE	0
42	TARGETS	NEAREST RESIDENCE	0
43		RECREATIONAL USE	0
44		TARGETS SCORE	SUM LINES 40 - 42
			0
		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
			0
45		TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	
		(LINES 10 + 24 + 35 + 44) / 100,000	180.73

SITE NAME: FLATHEAD MINE COMPLEX

PA NUMBER: 15-012

LINE
NO.**SITE SAFETY**

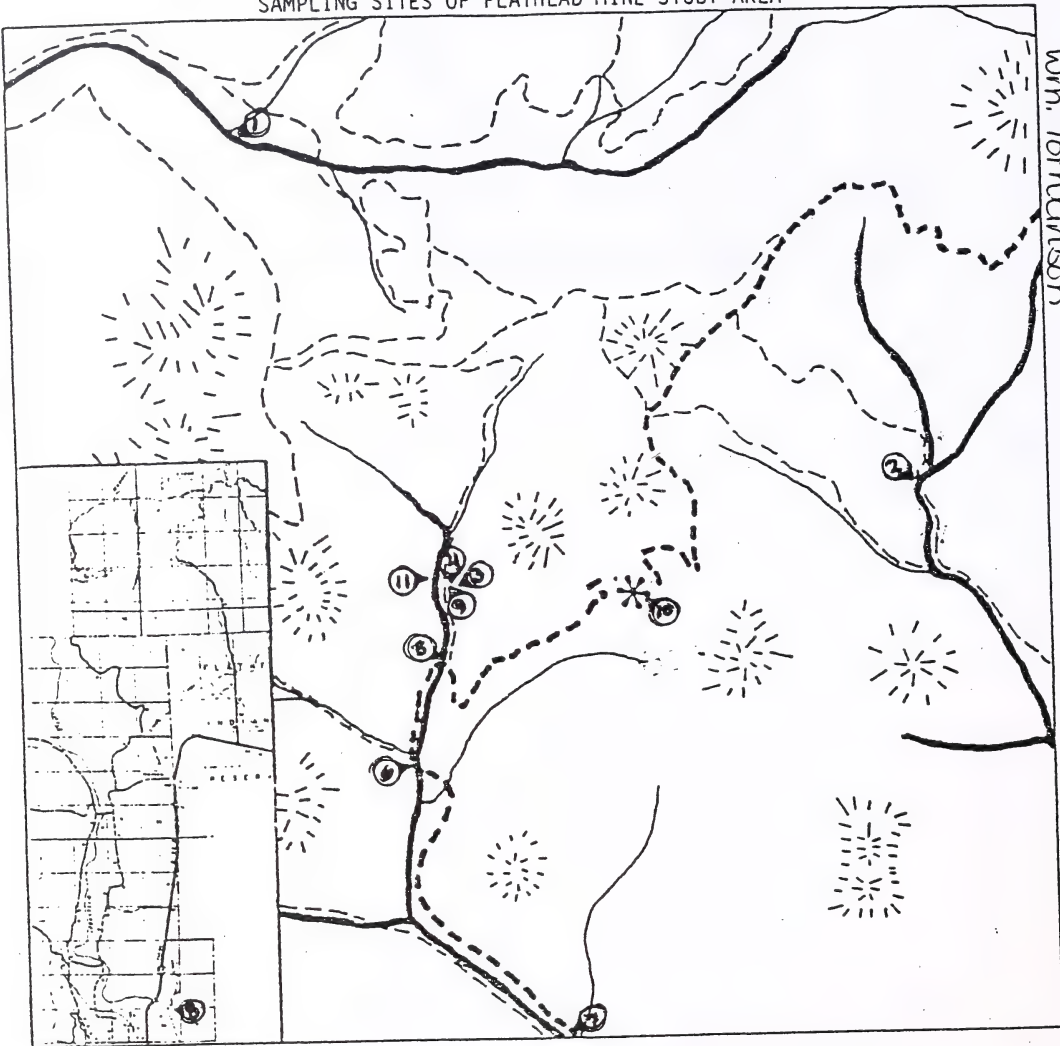
1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	(
3		OPEN ADITS	50 EA.	750
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	150
5		HAZ. STRUCTURES	40 EA.	320
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	1220
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	0.00

**SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES**

SAMPLING SITES OF FLATHEAD MINE STUDY AREA

Dr. G. Gordon
Klaus Lackenschwilt
Wm. Molina
Krishe Bixby
Wm. Tomlinson

1977



Site No. 1--Little Meadow Creek

2--Section 16 Creek

3--West Flathead Mine

4--Artesian Well

5--Sullivan Creek Pond

6--Sullivan Creek (upper)

Site No. 7--Sullivan Creek (lower)

8--Little Bitterroot River

9--Capped Well

10--Level 400 Tailings Dump

11--West Flathead Mine
Tailings

Figure 3

APPENDIX II

SITE LOCATIONS

Site No.	Site Name	Description
1	Little Meadow Creek	0.3 miles west from where road running north from Flathead Mine crosses the creek. Sampling site is 20 yards downstream from pine tree tagged with lime-green tape. NE $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$, Section 7, T25N, R23W
2	Section 16 Creek	1.0 mile east of Flathead Mine on road originating at north boundary of mine and descending into the Canyon. Sampling site is just upstream of culvert passing under road. SE $\frac{1}{4}$, NW $\frac{1}{4}$, SE $\frac{1}{4}$, Section 16, T25N, R23W
3	West Flathead Mine	Water flowing in the West Flathead Mine itself. NW $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Section 17, T25N, R23W
4	Artesian Well	400 foot well located just west of West Flathead Mine. NW $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Section 17, T25N, R23W
5	Sullivan Creek Pond	SW $\frac{1}{4}$, NW $\frac{1}{4}$, SW $\frac{1}{4}$, Section 17, T25N, R23W
6	Sullivan Creek (upper)	0.4 miles south of Sullivan Pond. Below small bridge on east side of road. NE $\frac{1}{4}$, SE $\frac{1}{4}$, NW $\frac{1}{4}$, Section 20, T24N, R23W
7	Sullivan Creek (lower)	1.3 miles south of Sullivan Pond, just above culvert running under road. SW $\frac{1}{4}$, SW $\frac{1}{4}$, SE $\frac{1}{4}$, Section 20, T25N, R23W
8	Little Bitterroot River	Below confluence of Little Bitterroot River and Sullivan Creek. NE $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$, Section 36, T23N, R24N
9	Capped Well	Located just west of West Flathead Mine. NW $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Section 17, T25N, R23W
10	Level 400 Tailings Dump	Main tailings dump at 400 level of Flathead Mine. SE $\frac{1}{4}$, NW $\frac{1}{4}$, SE $\frac{1}{4}$, Section 17, T25N, R23W
11	West Flathead Mine Tailings	Tailings dump west of road in West Flathead Mine area. SE $\frac{1}{4}$, NW $\frac{1}{4}$, SE $\frac{1}{4}$, Section 17, T25N, R23W

Table 1

WATER SAMPLE ANALYSES
(Parameters for Metals are Total Dissolved)

Environmental Studies Laboratory

Site Number	Temp (°C)	pH	Acidity to pH $\frac{--}{--}$ = -- mg CaCO ₃	Conductivity (umhos/cm)	PO ₄ (ug/l)	SO ₄ (ug/l)	NO ₃ (ug/l)	Ca (ug/l)	Mg (ug/l)	Fe (ug/l)
1	27	7.5	pH 9 9.68 mg	311.5	90	89,500	27	38,000	6,300	400
2	10	7.6	pH 9 12.3 mg	221.6	240	7,600	300	30,000	6,100	<200
3	11	6.5	--	--	--	--	--	--	--	--
4	14	5.5	--	--	--	--	--	54,000	4,800	16,600
5	18	3.5	pH 8.3 109 mg	958.3	50	243,600	30	115,000	13,900	1,330
6	14	3.9	pH 8.3 47 mg	982.3	100	241,100	30	129,000	20,900	<200
7	16	5.3	--	--	--	--	--	134,000	22,600	800
8	19	8.2	pH 9 14.96 mg	431.2	240	15,600	39	65,000	10,200	1,300
9	14	5.4	--	--	--	--	--	56,000	4,800	16,600

Table 1
(continued)

WATER SAMPLE ANALYSES

Reclamation and Research Laboratory (RR) and Montana Testing Laboratories (MT)

Site Number	Lab	Zn ($\mu\text{g/l}$)	Pb ($\mu\text{g/l}$)	Ag ($\mu\text{g/l}$)	Al ($\mu\text{g/l}$)	As ($\mu\text{g/l}$)	Cu ($\mu\text{g/l}$)	Cd ($\mu\text{g/l}$)
1	RR MT	-- <20	3.3 <3	1.0 <3	-- 328	2.6 <30	5.7 50	-- <20
2	RR MT	-- <20	<2 <3	0.9 <3	-- 39	3.2 <30	5.8 <10	-- <20
3	RR MT	-- --	<2 <3	0.8 <3	-- --	18.9 <30	6.0 50	-- --
4	RR MT	-- 5,000	<2 <3	1.0 <3	-- 79	27.6 <30	3.5 50	-- <20
5	RR MT	-- 10,000	3.0 <3	1.2 <3	-- 11,340	1.7 <30	122.7 310	-- <20
6	RR MT	-- 13,480	-- <3	-- <3	-- 3,750	-- <30	-- 200	-- <20
7	RR MT	-- 9,850	-- <3	-- <3	-- 960	-- <30	-- <10	-- <20
8	RR MT	-- <20	-- <3	-- <3	-- 880	-- <30	-- <10	-- <20
9	RR MT	-- 5,150	-- <3	-- <3	-- <20	-- <30	-- <10	-- <20

Table 2

SEDIMENT AND TAILINGS SAMPLE ANALYSES

Reclamation and Research Laboratory (RR) and Montana Testing Laboratories (MT)

Site Number	Location	Lab	Zn (µg/l)	Pb (µg/l)	Ag (µg/l)	As (µg/l)	Cd (µg/l)	Cu (µg/l)
1	Little Meadow Creek Sediments	RR MT	350,000 23,600	11,000 200	4,400 1,000	1,400 400	2,250 <20	60,000 --
2	Section 16 Creek Sediments	RR MT	90,000 9,000	21,000 1,600	3,200 500	1,600 <200	750 <20	47,000 --
5	Sullivan Pond Outflow Sediments	RR MT	150,000 30,000	50,000 1,400	2,000 1,900	5,800 200	500 <20	40,000 --
6	Sullivan Pond 0.4 miles below Pond Sediments	RR MT	1,055,000 123,600	270,000 400	3,600 2,300	7,200 200	5,250 <20	130,000 --
10	Level 400 Dump Tailings	RR MT	610,000 82,400	1,760,000 7,600	32,000 53,300	8,000 11,000	3,000 <20	91,000 --
11	West Flathead Mine Tailings	RR MT	2,345,000 136,800	5,800,000 28,200	180,000 92,100	8,500 18,000	17,250 <20	2,675,000 --

HOG HEAVEN HILL MINING
DISTRICT
WATER QUALITY SUPPLEMENT.

INTRODUCTION

Further investigation of the water quality in the Hog Heaven Hill Mining District was continued during 1978. Water samples were collected during May, late July, and late October to determine the effect of seasonal fluctuations in flow on the chemical constituent levels in the water. Because of the drought conditions experienced during the field season of 1977, additional examination of the water quality was necessary for a more typical water year to be analyzed. Sampling times attempted to correlate with spring runoff, typical summer levels, and late fall weather when ice formation had begun.

SITE DESCRIPTIONS

Several changes were made concerning the stations identified during the 1977 report. Station 9, the capped well, was excluded from the 1978 sampling. It was concluded that the ground water source for this station's water and station 4, the artesian well, were the same and therefore sampling both stations was unnecessary duplication. Station 4 was used as the representative of this ground water source because of its adequate supply of water.

As a result of the cave-in of the West Flathead Mine in the early spring, station 3A, Level Four Mine, was included in the sampling. The West Flathead Mine was added during the last two samplings upon its opening in late May. For further site descriptions in the study area, refer to Gordon, et.al.(1977).

SAMPLING AND ANALYTICAL METHODOLOGY

During each sampling trip, water was collected for the analysis of 17 parameters. Dissolved oxygen, specific conductivity, temperature, and pH were analyzed in situ with the aid of Chemtrix Field Meters.

Three bottles of water from each station were collected to be analyzed by the Reclamation and Research Laboratory in Bozeman. Calcium, magnesium, and dissolved cadmium, copper, iron, lead, silver, zinc, and arsenic were analyzed from a 250 ml sample filtered through a 45 μ Millipore filter and acidified with nitric acid to a pH less than 2. Sulfate, acidity, and phosphate were determined from a 500 ml sample unfiltered and with no pretreatment. A 250 ml sample, unfiltered and acidified with sulfuric acid, was collected for the analysis of nitrate. New polyurethane bottles were used for each collection. Appendix I contains a detailed description of the analytical methods used by the Reclamation and Research Laboratory for the water samples.

RESULTS

Water quality parameters of the nine stations in the Hog Heaven Hill Mining District are present in Table 1. Pyrite exposed to atmospheric or dissolved oxygen in water causes a chemical reaction to occur which creates a lowered pH, increased acidity, dissolved metals, and sulfate levels, and a precipitation of ferric hydroxide in the affected body of water. The results that will be emphasized from Table 1 are those that have been altered by acid mine drainage; specifically, pH, acidity, specific conductivity, the dissolved metals, sulfate and dissolved oxygen.

TABLE 1

WATER QUALITY RESULTS FOR THE HOG HEAVEN HILL MINING DISTRICT, 1978. (all results in mg/l unless otherwise stated. 1,000 ug/l = 1 mg/l)

Station	1	2	3	4	5	6	7	8	3A
Parameter									
pH									
05/01/78	7.4	7.5	4.92	5.63	3.59	4.4	7.2	7.5	---
07/31/78	8.2	7.7	3.9	5.4	3.6	4.6	6.3	7.7	6.6
10/27/78	7.6	7.45	---	5.35	3.4	4.1	5.9	10.1	6.3
Specific Cond. (umhos/cm)									
05/01/78	132.0	225.0	275.0	450.0	1450.0	925.0	1100.0	110.0	---
07/31/78	190.0	200.0	650.0	450.0	450.0	975.0	975.0	335.0	260.0
10/27/78	195.0	300.0	---	425.0	1050.0	900.0	925.0	375.0	395.0
Calcium									
05/01/78	6.90	15.00	18.10	24.20	65.50	73.00	124.00	7.40	---
07/31/78	11.00	12.00	117.50	23.20	121.00	77.00	92.00	23.00	24.70
10/27/78	11.10	25.00	---	28.80	82.00	98.00	106.00	23.80	26.50
Magnesium									
05/01/78	4.00	6.80	5.10	5.40	17.70	19.30	28.80	2.90	---
07/31/78	6.90	9.30	34.20	5.90	25.00	20.70	29.40	9.30	6.00
10/27/78	6.00	10.10	---	6.70	20.40	22.60	27.10	8.00	6.00
Iron-dis									
05/01/78	0.58	0.40	7.31	17.00	3.28	0.11	0.10	0.29	---
07/31/78	0.230	0.136	32.00	14.80	3.44	1.74	0.100	0.180	1.424
10/27/78	0.322	0.038	---	17.85	0.872	0.251	0.150	0.048	1.214
Arsenic-dis									
05/01/78	0.0044	0.0051	0.0034	0.00844	0.0050	0.0032	0.0032	0.0058	---
07/31/78	0.0012	0.0014	0.0023	0.0034	0.0011	0.0017	0.0013	0.0022	0.0018
10/27/78	0.0018	0.0021	---	0.0080	0.0016	0.0021	0.0015	0.0020	0.0018

TABLE 1 (CONT.)

Station	1	2	3	4	5	6	7	8	3A
Parameter									
Copper-dis									
05/01/78	0.004	0.002	0.060	<0.001	1.182	0.293	0.038	<0.001	-----
07/31/78	0.022	<0.005	0.415	<0.005	0.338	0.104	0.025	0.017	0.010
10/27/78	0.010	0.010	-----	0.014	0.164	0.064	0.020	0.016	0.016
Zinc-dis									
05/01/78	0.040	0.146	1.876	4.7000	22.680	16.800	19.180	0.020	-----
07/31/78	0.020	0.038	44.05	4.050	19.75	12.60	11.50	0.040	0.735
10/27/78	0.055	*0.026	-----	4.00	9.36	9.92	10.48	0.015	0.622
Lead-dis									
05/01/78	<0.010	<0.010	0.036	<0.010	0.010	<0.010	<0.010	<0.010	-----
07/31/78	0.030	0.020	0.674	0.020	0.022	0.068	<0.010	0.020	<0.010
10/27/78	<0.010	0.012	-----	<0.010	0.015	0.015	<0.010	<0.010	<0.010
Cadmium-dis									
05/01/78	<0.010	<0.010	0.164	<0.010	0.154	0.376	0.032	<0.010	-----
07/31/78	0.005	<0.005	1.520	0.005	0.031	0.030	<0.005	<0.005	0.005
10/27/78	0.005	0.005	-----	0.005	0.032	0.022	0.010	0.005	0.005
Silver-dis									
05/01/78	0.020	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-----
07/31/78	0.090	0.030	0.030	0.030	0.034	0.032	0.038	0.030	0.040
10/27/78	0.010	0.005	-----	0.008	0.017	0.006	<0.004	<0.004	<0.004
Sulfate									
05/01/78	26.0	60.7	111.0	195.9	637.8	474.8	572.9	7.7	-----
07/31/78	18.8	12.0	949.3	176.1	468.5	452.0	508.8	40.3	150.0
10/27/78	45.7	73.4	-----	173.0	496.2	441.0	451.7	16.8	138.0

TABLE 1 (CONT.)

Station	1	2	3	4	5	6	7	8	3A
Parameter									
Nitrate									
05/01/78	0.039	0.029	0.166	0.007	0.004	0.004	0.022	0.012	-----
07/31/78	<0.002	0.094	0.683	0.048	0.049	0.057	0.168	0.34	0.026
10/27/78	0.774	0.103	-----	0.182	0.210	0.774	0.704	0.806	0.080
Total P									
05/01/78	0.07	0.03	<0.01	0.01	0.01	0.01	0.01	0.06	-----
07/31/78	0.01	0.16	<0.01	0.01	0.01	0.01	0.02	0.06	0.02
10/27/78	0.01	0.15	-----	0.01	<0.01	<0.01	0.02	0.01	0.01
Acidity (mg/l as CaCO ₃)									
05/01/78	-----	-----	-----	-----	-----	-----	-----	-----	-----
07/31/78	-54.02	-85.05	438.90	37.94	135.85	67.20	25.40	-168.65	-5.95
10/27/78	-27.0	-69.80	-----	28.80	128.80	29.90	13.70	-171.0	0.2
Dis. Oxygen									
05/01/78	8.2	7.4	8.5	6.2	8.2	8.9	8.6	7.3	-----
07/31/78	7.15	7.5	5.2	0.2	4.4	7.1	7.15	7.3	4.9
10/27/78	10.2	---	-----	1.9	8.4	9.5	10.4	8.5	4.2
Temp. °C									
05/01/78	12	15	8	16	12	12	13	18	---
07/31/78	22	17	16	16	27	19	22	22	---
10/27/78	4.5	10	--	12	7	6	6	8	10



15-012, #25: Cavern-like slope near top



15-012, #27: Adit #1 and Adit #2



15-012, #26: Slope #4 and Cavern #2



15-012, #28: Adit #3



15-012, #5: WR-12 at lower tailings



15-012, #16: WR-4 and WR-5: upper dumps



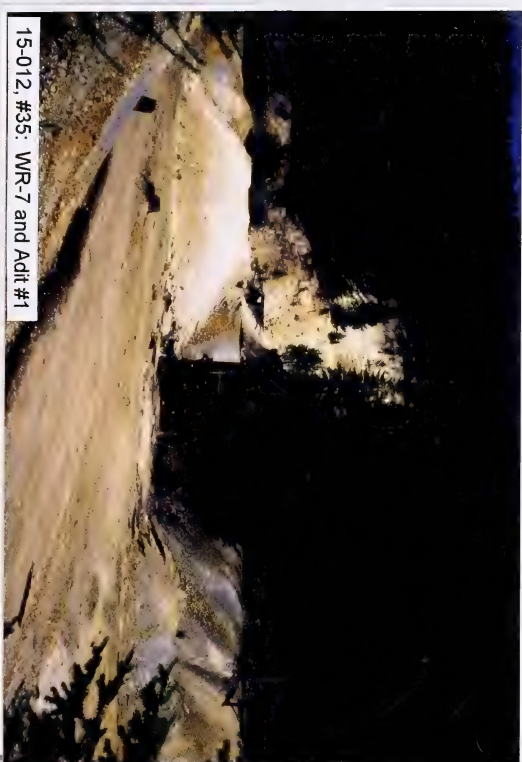
15-012, #17: WR-4 and WR-5: upper dumps



15-012, #24: Flathead Mine workings from the top



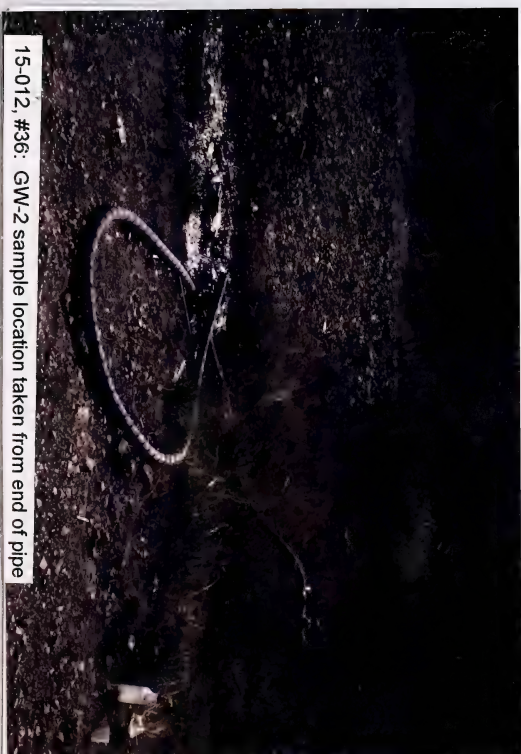
15-012, #33: WR-9 and Adit #3



15-012, #35: WR-7 and Adit #1



15-012, #34: Adit #2 and WR-8



15-012, #36: GW-2 sample location taken from end of pipe



15-012, #29: WR-3 (orange) bottom and WR-4 (tan) top



15-012, #31: WR-2 from top of WR-1, facing south



15-012, #30: Buildings on WR-1



15-012, #32: WR-10 with loadout



15-012, #37: WR-6

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ELK CREEK CORUNDUM PA#: 16-013

Date: August 12, 1993 Time: 1500

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer
Lasher, Pioneer

Visitors: Earl McCurley, MDSL
Tim Pfahler, MDSL

Weather/Seasonality Observations: Warm, 75°F; sunny; slight breeze, 5 mph; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #29: Shaft #1 (HMO) and headframe; #30: Mill foundation and WR-5; #31: WR-6 and stream area. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Site accessed by helicopter.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Deep shaft could be backfilled with the waste rock.



I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ELK CREEK CORUNDUM PA#: 16-013

Legal Description: T 3S; R 3E; Sec. 22, NE1/2 1/4 1/4
Sec. 23, NW1/2 1/4 1/4

County: GALLATIN Mining District: BOZEMAN

Latitude: N 45° 33' 48" Longitude: W 111° 20' 00"

Primary Drainage Basin and Code: Elk Creek/10020008

Secondary Drainage Basin: Elk Creek

USGS Quadrangle map name(s): Ruby Mountain

Mine Type/Commodities: Hardrock/Corundum

Activity Status: Active , Inactive/Exploration , Abandoned X.

Ownership status: Known YX N; private/public? Private
Owner, Agent, or Contact (Include address and phone when available): Turner Enterprises, Inc., P.O. Box 190 Gallatin Gateway, MT 59730. (406) 763-4419.

Relationship to other mines/sites in the area/district: Unknown; no other sites in close proximity.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 5900'-6300', Slope 8°-20°,
Aspect South to West, East

Land use: Mining , Recreational , Residential , Urban ,
Agricultural X, Other (Specify)

Area of disturbed/unvegetated lands? Approx. 0.3 acres.
Dimensions: The site is composed of five small sites over 1/2 mile.

Predominant vegetation types: Grass, sage, raspberries; roses in drainage.

Access: roads - good , poor , 4wd , trail X.
Other logistical considerations (proximity to other sites). No access roads

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). The mill, Shaft #1, and the majority of
adits lie on the east side of East Fork Elk Creek; one adit lies
on the west side of the East Fork Elk Creek and one shaft lies on
the knob above West Fork Elk Creek just before confluence with the
East Fork. Elk Creek flows north through the site. The site is
underlain by granitic intrusive with lots of biotite, quartz, and
corundum crystals.

Mining/milling history, ore type/tenor, host rock, gangue: Mill
was reported to have operated in 1901 and 1902; no other
information was available.

Mine Operation?

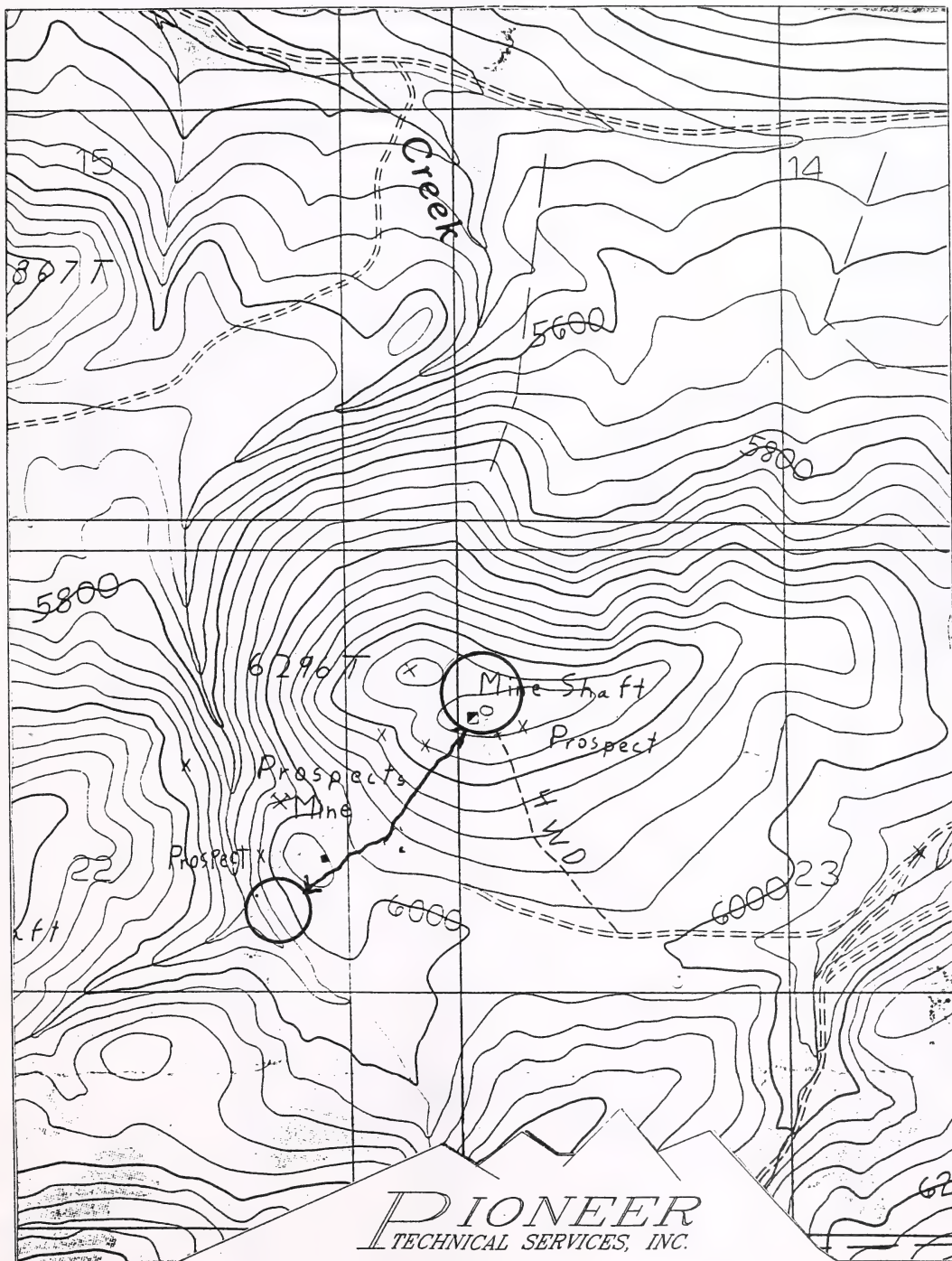
Shafts - Yes X, No , # 2, Comment Both open
Adits - Yes X, No , # 3, Comment Caved
Pits - Yes X, No , # 3+, Comment At least 3 by WR-2 and -3
Placers - Yes , No X, # , Comment
Other - Yes X, No , # , Comment Trenching by Shaft #2

Mill Operation? Yes X, No . If yes answer the next three
questions:

Period(s) of Operation: 1901 and 1902

Origin of Ore Milled - Custom Mill Dedicated Mill X; Number and
names of mines that supplied mill feed: Unknown

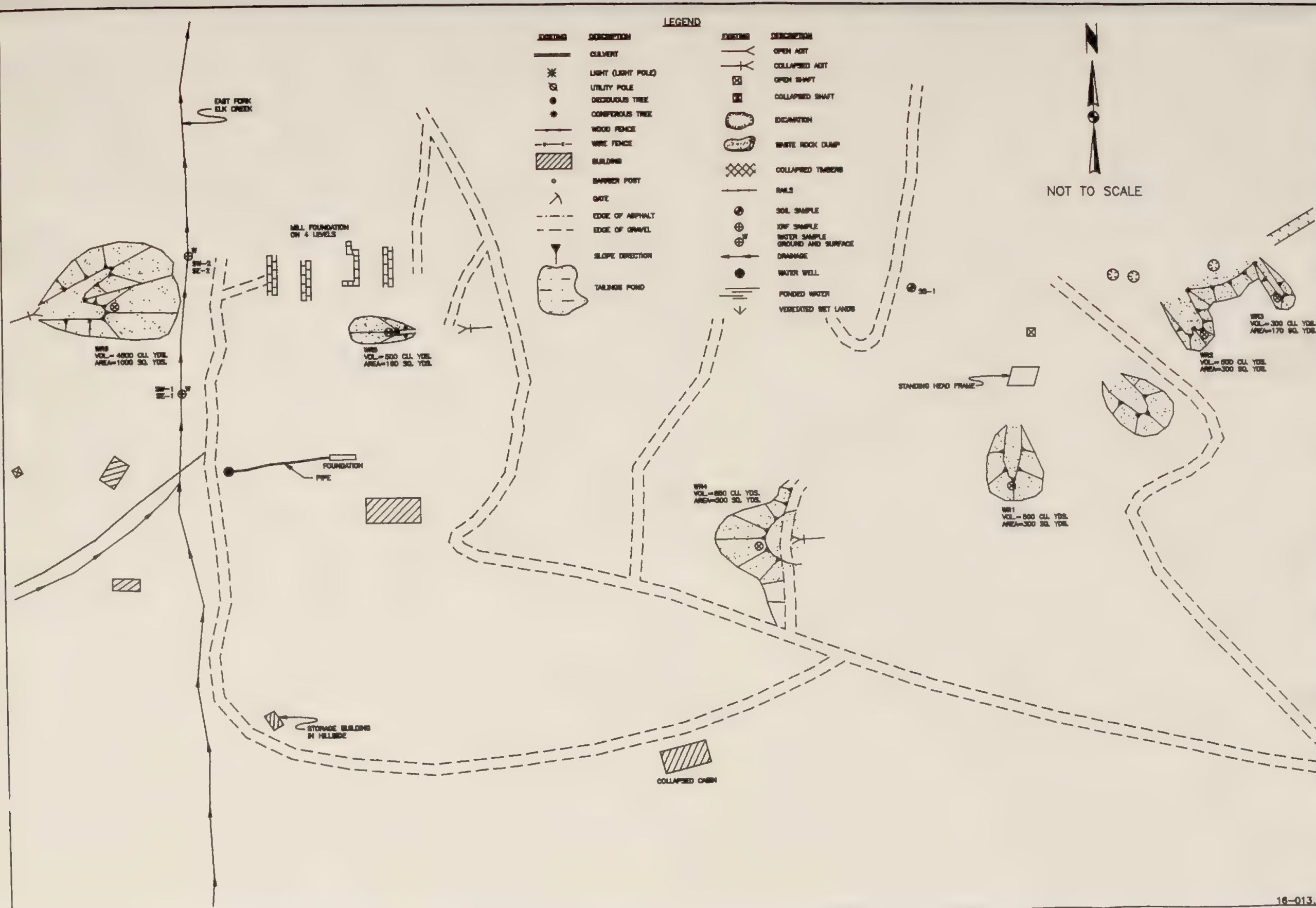
Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
Corundum



ELK CREEK CORUNDUM, P.A. NO. 16-013

T03S, R03E, SECTION 22

SCALE: 1" = 1000'



PIONEER
ENGINEERING & CONSULTANTS

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPOKANE

TDSH

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

ELK CREEK CORUNDUM PA# 16-013
BOZEMAN DISTRICT GALLATIN COUNTY

DATE: 30 NOV 93
JOB NO.: 93-17
DRAWN: JTP
DESIGNED: TDR
APPROVED: MJB
F.B. NO.

16-013.DWG SHEETS

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution(approximate % sand, silt, & clay):
No tailings could be identified in the area.

Determine tailings impoundment depth and describe stratification of the tailings if observable(based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment(Note condition of dams or structures, location of breaches): None

Comments on potential for mitigation: Any tailings that may have been present have been totally revegetated.

SAMPLERS: Flammanq, Lasher

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 16-013-WR-1 is composite of WR-1 through -6.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes , No X, Number: Identification:

Filled shafts: Yes , No X, Number: Identification:

Seeps/Springs: Yes X, No , Number: 1 Identification: Adjacent to Elk Creek

Groundwater wells within 4 miles?: Yes X, No ;
Number of well logs: 17

Distance to nearest well used for drinking? 2 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable , Possible , Unlikely X.

No water flowing on most of the site; metal values are low.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): East Fork Elk Creek

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): WR-6

Approximate Flood frequency? 1 yr, 10 yr, X 100 yr

Estimated seasonal flow of stream(s) (cfs)? 25 gpm during sampling
High Flow: 200 gpm, Average Flow: 30 gpm

Distance between waste source(s) and nearest surface water body (ft)? Approx. 10 feet between toe of WR-6 and East Fork Elk Creek.

Surface water draining onto or through waste sources: Yes , No X, Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetland, fishery, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes , No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): None observed during this investigation.

SAMPLERS: Babits

FLOW: Estimated (E) or Measured (M)?

MDSL AMRB/PIONEER 4/9/93

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 20 acres

Wetlands present: Yes X, No , Describe: Along East Fork Elk Creek
streambank

Carbonate rocks/soils: Yes , No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X; 30-100___;
100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or
greater___; Comments

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
----------	------	----------	-----	------

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammang, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (TSS/NO)	DUST PROPAGATION POTENTIAL(OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Dry	2,700	675	No	None
WR-2	None	Dry	2,700	1,350	No	None
WR-3	None	Dry	1,530	994	No	None
WR-4	None	Dry	4,500	3,600	No	None
WR-5	None	Dry	1,440	1,080	No	None
WR-6	None	Dry	9,000	4,500	No	None

Notes and Clarifications: _____

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X, Describe:_____

Population within 1 mile: 1-10 X; 10-30____; 30-100____; 100-300____; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____; Comments_____

Evidence of recreational use on site: Yes X, No____, Describe:_____
Off-road vehicle tracks_____

Accessibility - Fences, warning signs, closed roads? No road to the site; it is located on a private ranch.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes____, No X, Comment_____
Wilderness Area - Yes____, No X, Comment_____
T&E Species Habitat - Yes____, No X, Comment_____
Bat Habitat - Yes X, No____, Comment Open shafts

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality - High____, Medium X, Low____
Wetlands Frontage - High____, Medium X, Low____
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 2, types and locations:_____
Shaft #1 is located on a knob above East Fork Elk Creek and is very hazardous due to the fact that it cannot be seen while coming over the hill. Shaft #2 is on a knob overlooking West Fork Elk Creek.

Hazardous structures: Yes X, No____, Number 2, types and locations:_____
Hazardous headframe over Shaft #1; collapsing cabin approx. 1/4 mile southwest of Shaft #1.

Unstable highwalls, pits, trenches, slopes: Yes____, No X, Number____, types and locations:_____

Unstable waste piles, impoundments, undercut banks: Yes____, No X, Number____, types and locations:_____

Fire and/or Explosion hazards: Yes____, No X, Explain:_____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Elk Creek Corundum, Prepared by Chen-Northern, June 12, 1989.

USGS, Topographic Map, Ruby Mountain, Montana, 7 1/2 minute Quadrangle, 1987.

LABORATORY ANALYTICAL DATA

ELK CREEK CORUNDUM
PA NO. 16-013

Elk Creek Corundum PA# 16-013
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 08/12/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
16-013-SE-2	5 U	31.8	0.5 U	3.4	7.4	9.9	5170	0.028 U	99.1	10	8 U	6 U	19	NR
16-013-SE-1	5.33 U	31.8 J	0.58 UJ	3.33	8.63	7.84	4110	0.032 U	80.8	7.55	9.14 U	6.94 UJ	12	NR
16-013-WR-1	4 U	267	2 J	30.7	33.4	212	32100	0.234	309	52	7 U	5 U	64	NR
BACKGROUND	8.47	156 J	0.43 UJ	14.5	32.2	70.3	16600	0.027 U	382	33.6	16.1	5.18 UJ	46.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFATE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	1/1000	1/1000
16-013-WR-1	<0.01	0.00	17.0	17.0	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.00	0.00	17.0	17.8
16-013-WR-1DUF	0.01	0.31	17.8	17.8	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.00	0.00	17.8	17.8

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO ₃ /L)
16-013-SW-1	2.4	51.1	2.57 U	9.7 U	6.83 U	1.55 U	339	0.120	11.3	12.7 U	0.85	30.7 U	7.57 U	46.6
16-013-SW-2	2.71	51	2.57 U	9.7 U	6.83 U	1.55 U	360	0.120	13.1	12.7 U	1.74	30.7 U	7.57 U	47

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N	CYANIDE
16-013-SW-1	117	< 5.0	< 5	0.06	NR
16-013-SW-2	116	13.0	< 5	0.06	NR

LEGEND

SE1 - 100 feet upgradient of waste rock dump 6 in East Fork Elk Creek. SW1 - Same as sample SE1.
SE2 - At toe of waste rock dump 6 in East Fork Elk Creek. SW2 - Same as sample SE2.
BACKGROUND - On saddle west of shaft #1. From the Thumper Mica Mine (16-015-SS1-)

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

XRF ANALYSIS RESULTS

**ELK CREEK CORUNDUM
PA NO. 16-013**

Mine Name: Elk Creek Corundum PA# 16-013

XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
16-013-SS-1	532.813 *		8727.6	2463.15		1813.24	54146.4			84.7263 *	41.1642 *	48.0052
16-013-WR-1			26569.5	4926.9		1271.96 *	80755.3		240.013 *	167.158 *	41 *	252.43
16-013-WR-1-COMP			28880.4	5281.26		1658.01	75082.5		241.975	126.436 *	31.6866 *	198.813
16-013-WR-2			14637.7	4466.89		1130.13 *	67472.5		183 *	141.797 *	42.0384 *	199.166
16-013-WR-3			23232.8	5647.6		1779.34	90348.9		336.828	142.667 *	40.27 *	268.983
16-013-WR-4			22797.8	5227.44		1103.6 *	67350.6		130.906 *	135.383 *	54.2455 *	222.119
16-013-WR-5	325.371 *		40016.3	3554.59		1096.27 *	59918.2		150.492 *	149.908 *	26.1544 *	126.301
16-013-WR-6	362.636 *	14358.7	22405	3872.62		1222.13 *	63652.7		183.479 *	117.119 *	34.9267 *	233.021
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
16-013-SS-1	121.315				58.3776			184.305	87.9713 *		5.85776 *	
16-013-WR-1	227.4				59.207	183.657 *		390.091	126.823 *			
16-013-WR-1-COMP	172.933				84.9074			428.227				
16-013-WR-2	214.837				75.5579			597.177	88.3134 *		6.41059 *	
16-013-WR-3	219.786				94.858			322.26	113.045 *			
16-013-WR-4	160.121				87.5986			554.056	51.311			
16-013-WR-5	133.093				70.6508			309.35				
16-013-WR-6	141.963				95.23			405.074	93.7862 *			

* - Estimated Quantity

\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

ELK CREEK CORUNDUM
PA NO. 16-013

AIMSS SCORESHEET

SITE NAME: ELK CREEK CORUNDUM
PA NUMBER: 16-013

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	0.065
7	GW - TARGETS	WELLS - 1 TO 4 MI	0.0
8		NEAREST WELL	17
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9
			44
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD	EXCEEDENCES	0
13A	OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	0.117
17		IMPACTED DRAINAGE	0
18	SW - TARGETS	WETLANDS	10
19		FISHERY	1
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 - 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23
			842
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD	CONTAINMENT	1
26B	OF RELEASE	DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	0.004
30		NEAREST RESIDENCE	10
31	AIR - TARGETS	WETLANDS	0
32		PARKS / WILDERNESS	10
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 - 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34
			0
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF	ACCESSIBILITY	5
37B	EXPOSURE	DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT	POPULATION - 1 MILE	0.002
41	TARGETS	NEAREST RESIDENCE	1
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 - 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
			0
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		
	(LINES 10 + 24 + 35 + 44) / 100,000		0.01

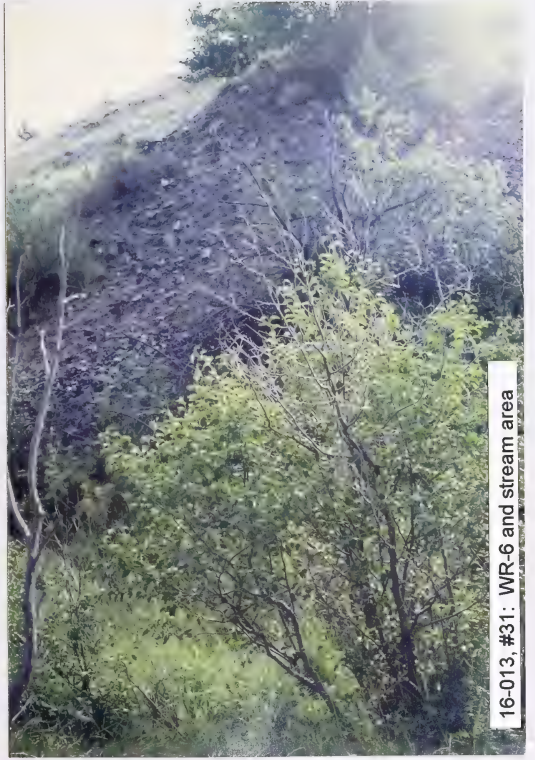
		SITE NAME: ELK CREEK CORUNDUM	
		PA NUMBER: 16-013	
LINE NO.	SITE SAFETY		
1	THREAT	ACCESSIBILITY	5
2	HAZARDS	OPEN SHAFTS 100 EA.	200
3		OPEN ADITS 50 EA.	0
4		UNSTAB. HIWALLS / PITS 75 EA.	0
5		HAZ. STRUCTURES 40 EA.	80
6		EXPLOSIVES	0
7		HAZ. MATERIALS	0
8	HAZARDS SCORE SUM LINES 2 - 7		280
9	TARGETS	POPULATION - 1 MILE	1
10		NEAREST RESIDENCE	0
11		RECREATIONAL USE	2
12		TARGETS SCORE SUM LINES 9 - 11	3
13	SITE SAFETY SCORE (LINES 1 x 8 x 12) / 1,000		4.20



16-013, #29: Shaft #1 and headframe



16-013, #30: Mill foundation and WR-5



16-013, #31: WR-6 and stream area

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: THUMPER MICA PA#: 16-015

Date: August 12, 1993 Time: 1730-1930

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Sunny; clear skies; cool, wet
spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #6: GW-1, seep at
WR-1; #7: Adit #1; #8: WR-1, looking south. Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms):
Access to site by truck.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Close HMO;
grade and revegetate dump.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): THUMPER MICA PA#: 16-015

Legal Description: T 4S; R 5E; Sec. 30, NE 1/4 1/4 1/4

County: GALLATIN Mining District: BOZEMAN

Latitude: N 45° 27' 41" Longitude: W 111° 08' 50"

Primary Drainage Basin and Code: Gallatin River/10020008

Secondary Drainage Basin: Mica Creek/Squaw Creek

USGS Quadrangle map name(s): Garnet Mountain

Mine Type/Commodities: Hardrock/Mica

Activity Status: Active , Inactive/Exploration , Abandoned X.

Ownership status: Known YX N; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Gallatin National Forest, P.O. Box 130, Bozeman, MT 59771.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 8000', Slope 17°,
Aspect Southeast

Land use: Mining , Recreational X, Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? 1 acres.
Dimensions:

Predominant vegetation types: Lodgepole pine, grasses

Access: roads - good X, poor , 4wd X, trail .
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Site lies on the northwest side of an
unnamed tributary to Mica Creek. Water leaving the site flows into
the tributary and then southwest and southeast into Mica Creek
approx. 2/3 mile away. Mica Creek flows into Squaw Creek approx.
2 1/2 miles away.

Mining/milling history, ore type/tenor, host rock, gangue: No
information available. Work has been conducted at this site within
the last 20 years.

Mine Operation?

Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 1, Comment Open
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes , No X. If yes answer the next three
questions:

Period(s) of Operation: N/A

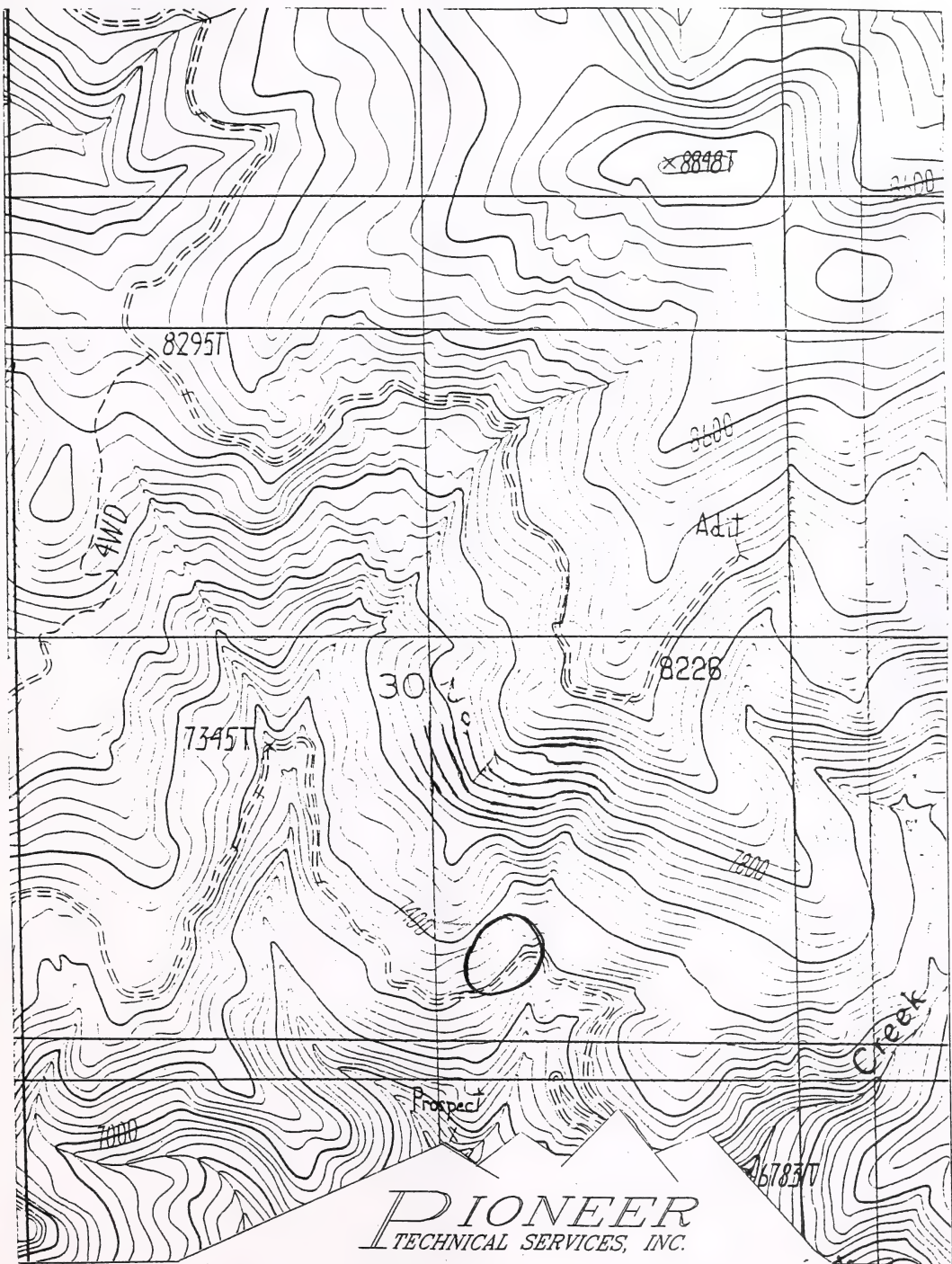
Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
1:100859	04S 04E 24 CDA	75.0	15.0	28.00

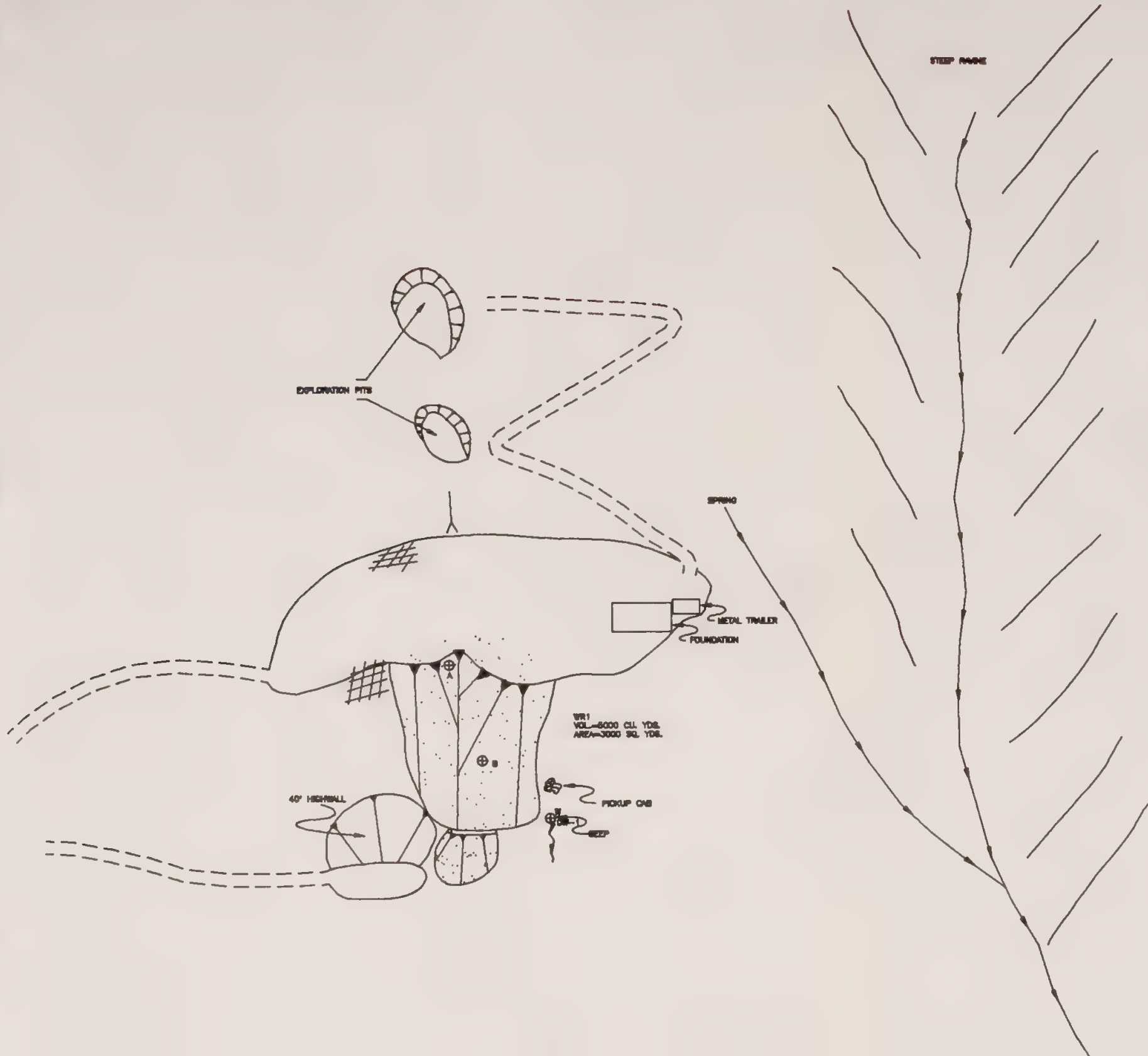


PIONEER
TECHNICAL SERVICES, INC.

THUMPER MICA, P.A. NO. 16-015

T04S, R05E, SECTION 30

SCALE: 1" = 1000'



SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
CLIMBER	CLIMBER	OPEN ADIT	OPEN ADIT
LIGHT (LIGHT POLE)	LIGHT (LIGHT POLE)	COLLAPSED ADIT	COLLAPSED ADIT
UTILITY POLE	UTILITY POLE	OPEN SHAFT	OPEN SHAFT
DECIDUOUS TREE	DECIDUOUS TREE	COLLAPSED SHAFT	COLLAPSED SHAFT
CONFIDENTIAL TREE	CONFIDENTIAL TREE	EXCAVATION	EXCAVATION
WOOD FENCE	WOOD FENCE	WASTE ROCK DUMP	WASTE ROCK DUMP
WIRE FENCE	WIRE FENCE	COLLAPSED TIMBERS	COLLAPSED TIMBERS
BUILDING	BUILDING	RAILS	RAILS
BARRIER POST	BARRIER POST	SOIL SAMPLE	SOIL SAMPLE
GATE	GATE	XRF SAMPLE	XRF SAMPLE
EDGE OF ASPHALT	EDGE OF ASPHALT	WATER SAMPLE	WATER SAMPLE
EDGE OF GRAVEL	EDGE OF GRAVEL	GROUND AND SURFACE	GROUND AND SURFACE
SLOPE DIRECTION	SLOPE DIRECTION	DRAINAGE	DRAINAGE
TAILINGS POND	TAILINGS POND	WATER WELL	WATER WELL
		PONDING WATER	PONDING WATER
		VEGETATED WET LANDS	VEGETATED WET LANDS

NOT TO SCALE

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

THUMPER MICA PA# 16-015
BOZEMAN DISTRICT GALLATIN COUNTY

PIONEER
ENGINEERING & CONSULTANTS

TD&H

DRAWN: JTP DATE: 23 NOV 93
DESIGNED: JTP JOB NO. 93-17
APPROVED: JTP F.B. NO.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
MONTANA WASHINGTON

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SAMPLERS: Belanger

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 16-015-WR-1 is composite of WR-1A and -1B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes ☐, No ☒, Number: Identification:

Filled shafts: Yes ☐, No ☒, Number: Identification:

Seeps/Springs: Yes ☒, No ☐, Number: Identification: GW-1 sample is a spring located approx. 100 feet east of the site.

Groundwater wells within 4 miles?: Yes ☒, No ☐;

Number of well logs: 60

Distance to nearest well used for drinking? 3 to 4 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite ☐, Probable ☐, Possible ☐, Unlikely ☒.

Dump is quite small and does not appear to stress any vegetation nor have any harmful effects; however, it does have a seep. Metal values in dump are at or below expected background levels.

Other observations/notes: N/A

SAMPLERS: Bullock

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Unnamed tributary to Mica Creek

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes X, No , Name(s)/Description: Seep near WR-1

Waste materials within any floodplain: Yes , No X Source ID(s):

Approximate Flood frequency? 1 yr, 10 yr, X 100 yr

Estimated seasonal flow of stream(s) (cfs)?
High Flow: 1.0 cfs, Average Flow: 0.1 cfs

Distance between waste source(s) and nearest surface water body (ft)? 60 feet

Surface water draining onto or through waste sources: Yes X, No ,
Describe: Seep from bottom of WR-1

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
The Gallatin River is 10 miles away and has irrigation, stock watering, fishery, and recreation.

Observed erosional/sedimentation/stream turbidity problems? Yes ,
No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
None observed during this investigation.

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe:_____

Population within 1 mile: 1-10____; 10-30____; 30-100____; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments None

Evidence of recreational use on site: Yes X, No____, Describe:_____
Campfire rings

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes____, No X, Comment_____
Wilderness Area - Yes____, No X, Comment_____
T&E Species Habitat - Yes____, No X, Comment_____
Bat Habitat - Yes X, No____, Comment Open adit

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality - High____, Medium____, Low Not Rated
Wetlands Frontage - High____, Medium____, Low Not Rated
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 1, types and locations:____
Adit

Hazardous structures: Yes____, No X, Number____, types and locations:____

Unstable highwalls, pits, trenches, slopes: Yes X, No____, Number 2,
types and locations: Highwall above adit and also associated with
exploration activity directly below WR-1.

Unstable waste piles, impoundments, undercut banks: Yes____, No X,
Number____, types and locations:_____

Fire and/or Explosion hazards: Yes____, No X, Explain:_____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Thumper Mica, Prepared by Chen-Northern, June 14, 1989.

USGS, Topographic Map, Garnet Mountain, Montana, 7 1/2 minute Quadrangle, 1988.

LABORATORY ANALYTICAL DATA

THUMPER MICA
PA NO. 16-015

Thumper Mine PA# 16-015
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 08/12/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
16-015-WR-1	4.99 U	3.37 J	0.54 U	2.05 U	1.45 U	7.27	1450	0.025 U	37.8	10.5	11.3	6.49 UJ	17.5	NR
BACKGROUND	8.47	156 J	0.43 UJ	14.5	32.2	70.3	16600	0.027 U	382	33.6	16.1	5.18 UJ	46.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000	POTENT.	1/1000	%	POTENT.	%	POTENT.	%	POTENT.	1/1000	1/1000	POTENT.	1/1000
16-015-WR-1	<0.01	0.00	0.24	0.24	<0.01	<0.01	<0.01	<0.01	0.01	0.00	0.00	0.24		

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO ₃ /L)
16-015-GW-1	1.9	18.1	2.57 U	9.7 U	6.83 U	6.9 J	367	0.120 U	20.1	16	1.61	30.7 U	12.7	30

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N	CYANIDE
16-015-GW-1	68	7.0	7	0.15	NR

LEGEND

WR1 - Composite of subsamples WR1A and 1B.
BACKGROUND - From Thumper Mtn (16-015-SS-1).
GW1 - Seepage from waste rock dump 1.

XRF ANALYSIS RESULTS

**THUMPER MICA
PA NO. 16-015**

Mine Name: Thumper Mica PA# 16-015
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
16-015-WR1-A		3930.38	954.94		154.542 *		408.028 *					4.10226 *
16-015-WR1-B		28471.8	4674.88	432.701 *	208.266 *	375.375 *	5478					118.226
16-015-WR-1-COMP		27638.8	2251.37	341.879 *	217.974 *	324.008 *	3953.77			55.3544 *		76.3869
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
16-015-WR1-A					12.4921 *						6.23271 *	
16-015-WR1-B				27.7935 *	160.241			405.398			15.7433 *	
16-015-WR-1-COMP					151.601			261.402			12.7854 *	

* - Estimated Quantity
\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

THUMPER MICA
PA NO. 16-015

AIMSS SCORESHEET

SITE NAME:
PA NUMBER:

THUMPER MICA
16-015

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.004
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		59
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	61.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	98
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		10
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	200
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	200
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.004
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		0
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	7
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	6
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.000
29		POPULATION - 4 MILES		10
30	AIR - TARGETS	NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	10
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	0
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.000
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 - 42	5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	0
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			0.00

LINE NO.	SITE SAFETY			THUMPER MICA 16-015
	THREAT	ACCESSIBILITY		
1		OPEN SHAFTS	100 EA.	20
2		OPEN ADITS	50 EA.	0
3		UNSTAB. HIWALLS / PITS	75 EA.	50
4	HAZARDS	HAZ. STRUCTURES	40 EA.	150
5		EXPLOSIVES		0
6		HAZ. MATERIALS		0
7		HAZARDS SCORE	SUM LINES 2 - 7	0
8				200
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	5
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	20.00



16-015, #7: Adit #1



16-015, #9: WR-1A



16-015, #6: GW-1 sample location



16-015, #8: WR-1, facing south

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: KARST ASBESTOS PA#: 16-018

Date: August 13, 1993 Time: 0800

Field Team Leader: Babits, Pioneer

Sampling Personnel: Lasher, Pioneer
Flammang, Pioneer

Visitors: Earl McCurley, MDSL
Tim Pfahler, MDSL

Weather/Seasonality Observations: Rain (off and on); cool to warm
(55°F to 65°F); breezy to still; cool, wet summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: Adit-1 on top
upper part of mine, open; #2: Outcrop of asbestos; #3: Mill
structure; #4: Fibers in dirt next to mill. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms):
Upper area of site consists of an open adit and a dump. Lower area
of the site consists of washing mill and associated wastes.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Easy to
coversoil and revegetate; fill adit with backfill material.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): KARST ASBESTOS PA#: 16-018

Legal Description: T 5S ; R 4E ; Sec. 36 , NW1/4 SW1/4 1/4

County: GALLATIN Mining District: WEST GALLATIN

Latitude: N 45° 21' 25" Longitude: W 111° 10' 60"

Primary Drainage Basin and Code: Gallatin River/10020008

Secondary Drainage Basin: Gallatin River

USGS Quadrangle map name(s): Hidden Lake

Mine Type/Commodities: Hardrock/Asbestos

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Gallatin National Forest, P.O. Box 130, Bozeman, MT 59771.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? The site is currently listed under the CECRA Program.

General site features: Elevation 6800' , Slope 35° ,
Aspect South

Land use: Mining , Recreational X , Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? Approx. 0.25 acres.
Dimensions:

Predominant vegetation types: Pine, grasses

Access: roads - good , poor , 4wd , trail X .
Other logistical considerations (proximity to other sites). Old road present that needs repair.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There are 30 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Site lies on west side of perennial
Gallatin River on a perennial unnamed tributary. Water leaving the
site runs down tributary to river, which flows south. The area is
underlain by a thick sequence of metamorphic rocks. Peridotite has
intruded these rocks and the amphibole asbestos is found only in
altered peridotite as irregular veins and lenses. Most veins are
vertical and strike N to N45W. Metamorphic rocks are of Pony
sequence.

Mining/milling history, ore type/tenor, host rock, gangue:
Deposit was discovered in 1903. Mill was built sometime before
1938. It was estimated in 1938 that approx. 1,800 tons of asbestos
were marketed. Asbestos ore appears in two forms. In and near
shear zones, asbestos is "soft and easily fluffed" and asbestos
from veinlets is "hard and very brittle". Host rock are
metamorphic schists and gneisses of the Pony Group and the intruded
peridotite. The amphibole asbestos (anthophyllite) is sometimes
associated with sericite, biotite, and talc.

Mine Operation?

Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 1, Comment Partially collapsed
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three
questions:

Period(s) of Operation: Built sometime before 1938, but not in
production in 1938 or 1959.

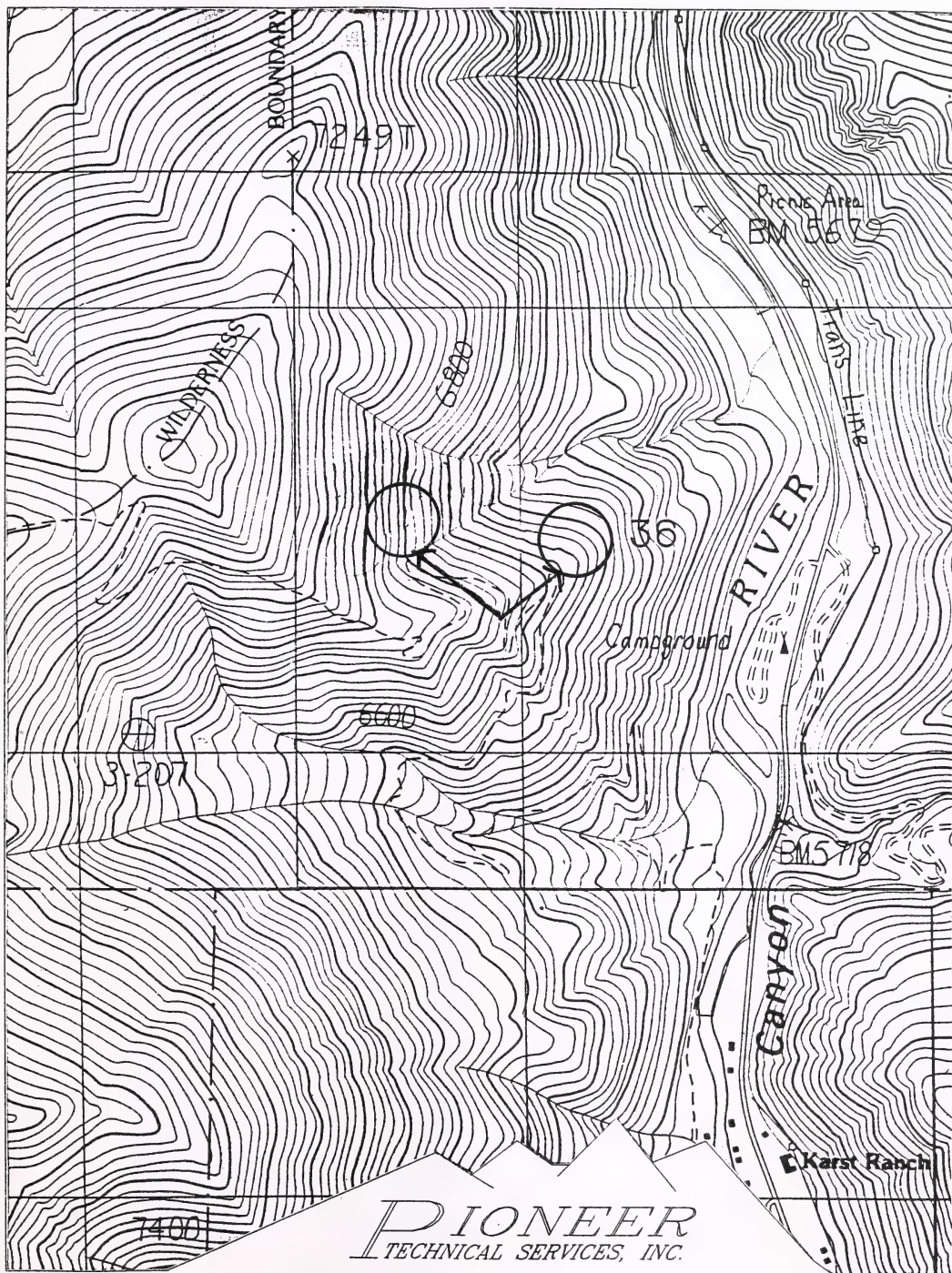
Origin of Ore Milled - Custom Mill Dedicated Mill X; Number and
names of mines that supplied mill feed: Karst Asbestos

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Hammer Mill with air classification. Considered a sifting-
washing mill. A flume carried water to top floor and out at second
floor back down to stream.

Montana Bureau of Mines and Geology
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:102460	05S 04E 36 DCD	38.0	50.0	10.00
M:130012	06S 04E 01	182.0	15.0	15.00
M:103512	06S 04E 01	34.0	34.0	32.00
M:103510	06S 04E 01	26.0	12.0	17.00
M:103511	06S 04E 01	26.0	12.0	17.00
M:103516	06S 04E 01 A	32.0	40.0	5.00
M:103514	06S 04E 01 A	30.0	15.0	7.00
M:103518	06S 04E 01 A	40.0	20.0	20.00
M:103520	06S 04E 01 A	29.0	15.0	20.00
M:103513	06S 04E 01 A	35.0	10.0	22.00
M:103517	06S 04E 01 A	127.0	2.0	75.00
M:103519	06S 04E 01 A	60.0	20.0	42.00
M:103515	06S 04E 01 A	23.0	15.0	8.00
M:124068	06S 04E 01 AA	165.0	10.0	101.00
M:103521	06S 04E 01 ACB	60.0	10.0	40.00
M:103522	06S 04E 01 ACC	140.0	5.0	65.00
M:103523	06S 04E 01 ACD	50.0	40.0	23.00
M:103525	06S 04E 01 AD	33.0	30.0	11.00
M:103524	06S 04E 01 AD	31.0	12.0	15.00
M:103526	06S 04E 01 ADD	50.0	45.0	5.00
M:103527	06S 04E 01 C	0.0	4.0	0.00
M:103529	06S 04E 01 D	180.0	5.0	120.00
M:103528	06S 04E 01 D	95.0	10.0	0.00
M:103530	06S 04E 01 DA	42.0	10.0	10.00
M:103531	06S 04E 01 DB	52.0	40.0	14.00
M:103532	06S 04E 01 DBA	42.0	15.0	22.00
M:103533	06S 04E 01 DD	27.0	30.0	11.00
M:103535	06S 04E 01 DD	95.0	15.0	36.00
M:103534	06S 04E 01 DD	29.0	20.0	14.00
M:103536	06S 04E 02	26.0	0.0	0.00



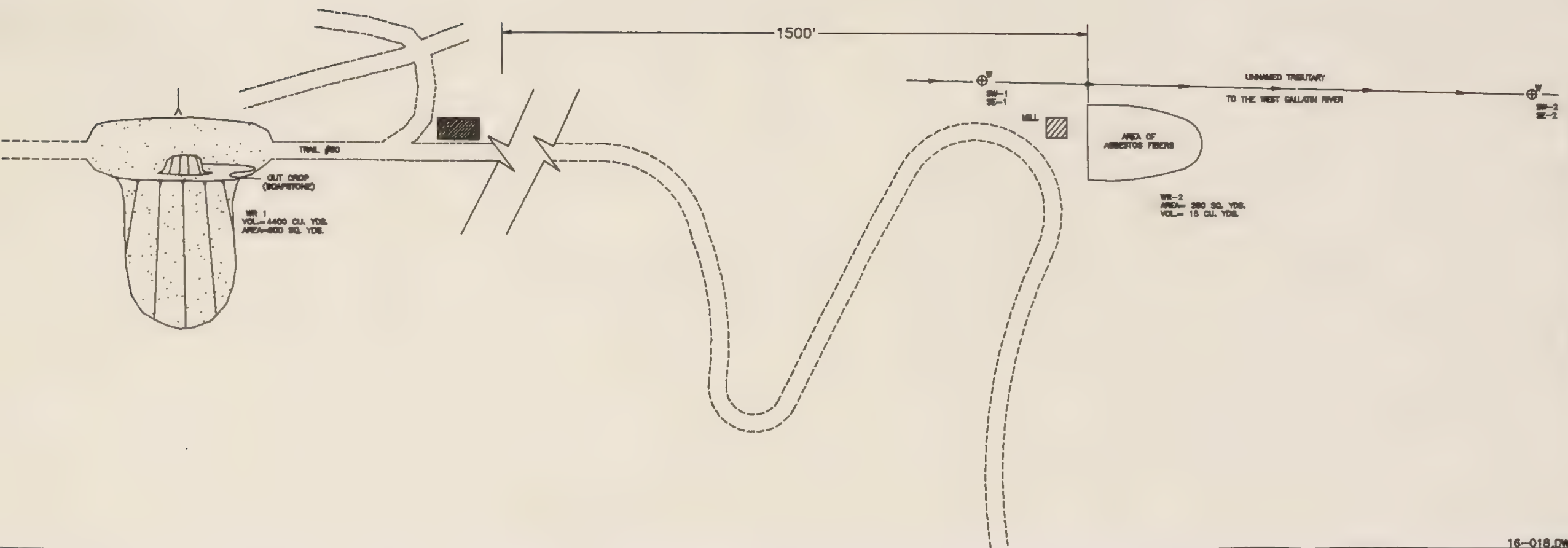
KARST ASBESTOS, P.A. NO. 16-018

T05S, R04E, SECTION 36

SCALE: 1" = 1000'



SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
=====	CLUMBER	⊕	OPEN ADT
*	LIGHT (LIGHT POLE)	⊗	COLLAPSED ADT
○	UTILITY POLE	⊕	OPEN SHAFT
●	DECIDUOUS TREE	⊗	COLLAPSED SHAFT
●	CONIFEROUS TREE	○	EXCAVATION
— — —	WOOD FENCE	○	WHITE ROCK DUMP
— — —	WIRE FENCE	⊗	COLLAPSED TIMBERS
▨	BUILDING	— —	RAILS
○	BARRIER POST	⊕	SOIL SAMPLE
∧	GATE	⊕	SPW SAMPLE
---	EDGE OF ASPHALT	⊕	WATER SAMPLE
---	EDGE OF GRAVEL	⊕	GROUND AND SURFACE
→	SLOPE DIRECTION	→	DRAINAGE
○	TAILINGS POND	●	WATER WELL
		≡	PONDED WATER
		→	VEGETATED WET LANDS



PIONEER ENGINEERING & SURVEYING, INC. 1000 N. 10TH ST. SPOKANE, IDAHO 83402	DRAWN: JTP DESIGNED: JTP APPROVED: MJB	DATE: 18 NOV. 83 JOB NO.: 83-17 F.B. NO.:
	THOMAS, DEAN & HOSKINS INC. ENGINEERING CONSULTANTS GREAT FALLS - BOZEMAN - KALISPELL - SPOKANE MONTANA - WASHINGTON	
MONTANA DEPT. OF STATE LANDS HAZARDOUS MATERIAL INVENTORY KARST ASBESTOS PA# 16-018 WEST GALLATIN DISTRICT GALLATIN COUNTY		
SHEET NO. 16-018.DWG SHEETS		

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Mill only washed ore; grain size is not applicable.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): It appears that majority of asbestos fibers below washing facility are within 2+ inches of the surface. All is mixed with dirt.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): None

Comments on potential for mitigation: Coversoil and revegetate

SAMPLERS: Flammanq

[illegible]

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: Samples were a 0 inch to 2 inch composite of 5 to 10 spots to sample material available through direct contact or inhalation.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes ☐, No ☒, Number: Identification:

Filled shafts: Yes ☐, No ☒, Number: Identification:

Seeps/Springs: Yes ☐, No ☒, Number: Identification:

Groundwater wells within 4 miles?: Yes ☒, No ☐;
Number of well logs: 71

Distance to nearest well used for drinking? 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite ☐, Probable ☐, Possible ☐, Unlikely ☒.

Non-mobile nature of contaminant

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Unnamed tributary to West Gallatin River

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes , No X Source ID(s):

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 15 gpm during sampling
High Flow: 100 gpm, Average Flow: 20 gpm

Distance between waste source(s) and nearest surface water body (ft)? 50 feet

Surface water draining onto or through waste sources: Yes , No X, Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, wetland, irrigation, agriculture, possible residential

Observed erosional/sedimentation/stream turbidity problems? Yes , No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):

SAMPLERS: M. Babits/ Lasher

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): SW-1 information was misplaced after the investigation. NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 0

Wetlands present: Yes X, No , Describe: Streamside

Carbonate rocks/soils: Yes X, No , Describe: Limestone

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 X;
100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 1 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

SAMPLERS: Babits, Flammanq, Lasher

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe:

Population within 1 mile: 1-10___; 10-30 X; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments

Evidence of recreational use on site: Yes X, No , Describe: Forest
Service trail through both upper and lower sites.

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes , No X, Comment
Wilderness Area - Yes X, No , Comment Near Lee Metcalf
T&E Species Habitat - Yes X, No , Comment Peregrine Falcon
Bat Habitat - Yes , No X, Comment

Primary Drainage ; Secondary Drainage X ; No Information :

Riparian Habitat Quality - High___, Medium X, Low___
Wetlands Frontage - High___, Medium X, Low___
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 1

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No , Number 1, types and locations:
Partially collapsed adit

Hazardous structures: Yes X, No , Number 1, types and locations: Mill structure

Unstable highwalls, pits, trenches, slopes: Yes___, No X, Number___,
types and locations:

Unstable waste piles, impoundments, undercut banks: Yes____, No X,
Number _____, types and locations:

Fire and/or Explosion hazards: Yes X, No , Explain: Wood mill building

Bibliography

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- MBMG, Karst, Gallatin County, Form 39, 1966-1971.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDHES/SHWB, Preliminary Assessment for the Asbestos Mine (Karst), December 5, 1983.
- MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Karst Asbestos, Prepared by Chen-Northern, June 16, 1989.
- MDSL/AMRB Files, Mine Report, Karst Asbestos Mine, Montana Asbestos Company - Bozeman, Montana. October 13, 1939.
- Perry, Eugene S., Report on Properties of the Karst Asbestos Company, August 29, 1938.
- USGS, Topographic Map, Hidden Lake, Montana, 7 1/2 minute Quadrangle, 1988.



LABORATORY ANALYTICAL DATA

KARST ASBESTOS
PA NO. 16-018

Karst Asbestos PA# 16-018
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 08/13/93

SOLID MATRIX ANALYSES

FIELD ID	Homogeneity	Color	Texture	Sample Description	Analysis	Asbestos Type Identified	% Anthrophyllite (Conc. on area basis)	% Total Asbestos (Conc. on area basis)	% Cellulose	% Other Non-Fibrous (Range)
16-018-SE-1*	Heterogeneous	Brown	Granular	Soil	PLM	-	NR	ND	Trace	90-100
16-018-SE-2*	Heterogeneous	Brown	Granular	Soil	PLM	-	NR	ND	Trace	90-100
16-018-WR-1*	Heterogeneous	Brown	Granular	Soil	PLM	100% Anthro.	5-10	5-10	Trace	90-100
16-018-WR-2*	Heterogeneous	Brown	Granular	Soil	PLM	100% Anthro.	5-10	5-10	Trace	90-100
Karst Mine**	Homogeneous	Grey	Fibrous	-	PLM	100%	-	NR	-	0
Karst Mill**	Homogeneous	Grey	Fibrous	-	PLM	95%	-	NR	-	5
						5% OTHER				

NR - Not Requested; ND - Not Detected; Trace = <1%
 * Data obtained from DATACHEM Laboratories.

** Data obtained from EMML.

WATER MATRIX ANALYSES

FIELD ID	Chrysotile (MFL)	Grunerite (MFL)	Riebeckite (MFL)	Actinolite-Tremolite (MFL)	Anthrophyllite (MFL)	Total Fibers Detected	Total Asbestos Conc. (MFL)	Limit of Detection (MFL)
16-018-SW-1*	<LOD	<LOD	<LOD	<LOD	<LOD	0	<LOD	0.09
16-018-SW-2*	<LOD	<LOD	<LOD	0.38	0.38	4	0.76	0.19

LOD - Less than limit of detection.

MFL - Millions of fibers per liter.

LEGEND

SE1 - 200' upgradient of mill in unnamed tributary.
 SE2 - 200' downgradient of mill in unnamed tributary.
 WR1 - In waste rock pile in front of adit #1.
 WR2 - In downgradient washing mill in waste rock.
 SW1 - Same location as SE1. Sample also contained asbestos fiber <10um long and many non-asbestos fibers.
 SW2 - Same location as SE2.

NOTE: EPA regulations specify that drinking water must contain less than 7MFL asbestos.

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

KARST ASBESTOS
PA NO. 16-018

AIMSS SCORESHEET

SITE NAME:

KARST ASBESTOS

PA NUMBER:

16-018

LINE
NO.

		<u>GROUNDWATER PATHWAY</u>	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.000
6		WELLS - 1 MI. x 2.5	75.0
7	GW - TARGETS	WELLS - 1 TO 4 MI	41
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 116.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 0

		<u>SURFACE WATER PATHWAY</u>	
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	10
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 200
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 500
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 150.500
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	10
19	SW - TARGETS	FISHERY	1
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 - 22 23
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 1730750

		<u>AIR PATHWAY</u>	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	15
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 75
27		LIKELIHOOD SCORE	LINES 25 + 26C 75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.550
29		POPULATION - 4 MILES	30
30		NEAREST RESIDENCE	0
31	AIR - TARGETS	WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 - 33 45
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 1856

		<u>DIRECT CONTACT PATHWAY</u>	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.550
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	10
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	5
43		TARGETS SCORE	SUM LINES 40 - 42 15
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 1238

45 **TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE**
(LINES 10 + 24 + 35 + 44) / 100,000

17.34

LINE NO.	SITE SAFETY			20 0 50 0 40 0 0 90 10 0 5 15 27.00
	THREAT	ACCESSIBILITY		
1		OPEN SHAFTS	100 EA.	
2		OPEN ADITS	50 EA.	
3	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	
4		HAZ. STRUCTURES	40 EA.	
5		EXPLOSIVES		
6		HAZ. MATERIALS		
7		HAZARDS SCORE	SUM LINES 2 - 7	
8	TARGETS	POPULATION - 1 MILE		
9		NEAREST RESIDENCE		
10		RECREATIONAL USE		
11		TARGETS SCORE	SUM LINES 9 - 11	
12		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	
13				



16-018, #2: Close-up of WR-1 with asbestos



16-018, #4: Asbestos fibers in soil next to mill



16-018, #1: Adit at WR-1



16-018, #3: Mill structure

GRANITE

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ALPS PA#: 20-065

Date: June 30, 1993 Time: 1430

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H

Visitors: Unidentified Forest Service employee

Weather/Seasonality Observations: Partly cloudy; slight breeze;
cool (50°F); cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #13: Adit discharge;
#14: Discharge from adit over dump (WR-1); #15: Cabins.
Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms):
The Alps mine is on topographic map approx. 0.25 mile southeast
from the mine that was visited. The Chen-Northern site sketch
describes the mine that was visited by Pioneer, but incorrectly
calls it the Alps mine. The name is unknown.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Adit
discharge has low pH and flows over waste rock, but does not have
elevated metal levels. There are two open adits and one open shaft
that should be closed. Dumps are steep and large; high iron
content could be reprocessed.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ALPS PA#: 20-065

Legal Description: T 10N; R 16W; Sec. 27, SE1/4 1/4 1/4

County: GRANITE Mining District: ALPS

Latitude: N 46° 35' 35" Longitude: W 113° 35' 10"

Primary Drainage Basin and Code: Brewster Creek/17010202

Secondary Drainage Basin: Unnamed Tributary to Brewster Creek

USGS Quadrangle map name(s): Spink Point

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active , Inactive/Exploration X, Abandoned .

Ownership status: Known YX N; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): David J.

Maclay, 828 Ronald Avenue, Missoula, MT 59801. (406) 549-7645.

Relationship to other mines/sites in the area/district: Many
mines in Alps district.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? Permit unknown; one shaft has a MDSL
sign; two adits with cable closure.

General site features: Elevation 6600', Slope 38°,
Aspect North

Land use: Mining , Recreational X, Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? < 1 acres.
Dimensions:

Predominant vegetation types: Pine

Access: roads - good , poor X, 4wd , trail .
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Site lies near headwaters of perennial
Brewster Creek. Brewster Creek flows into the perennial stream,
Rock Creek, six miles downstream near Quigley.

Mining/milling history, ore type/tenor, host rock, gangue: No
information available.

Mine Operation?

Shafts - Yes X, No , # 1, Comment Open

Adits - Yes X, No , # 4, Comment 2 open; 2 caved; 1 has
water

Pits - Yes , No X, # , Comment

Placers - Yes , No X, # , Comment

Other - Yes X, No , # 1, Comment Stope

Mill Operation? Yes , No X. If yes answer the next three
questions:

Period(s) of Operation: N/A

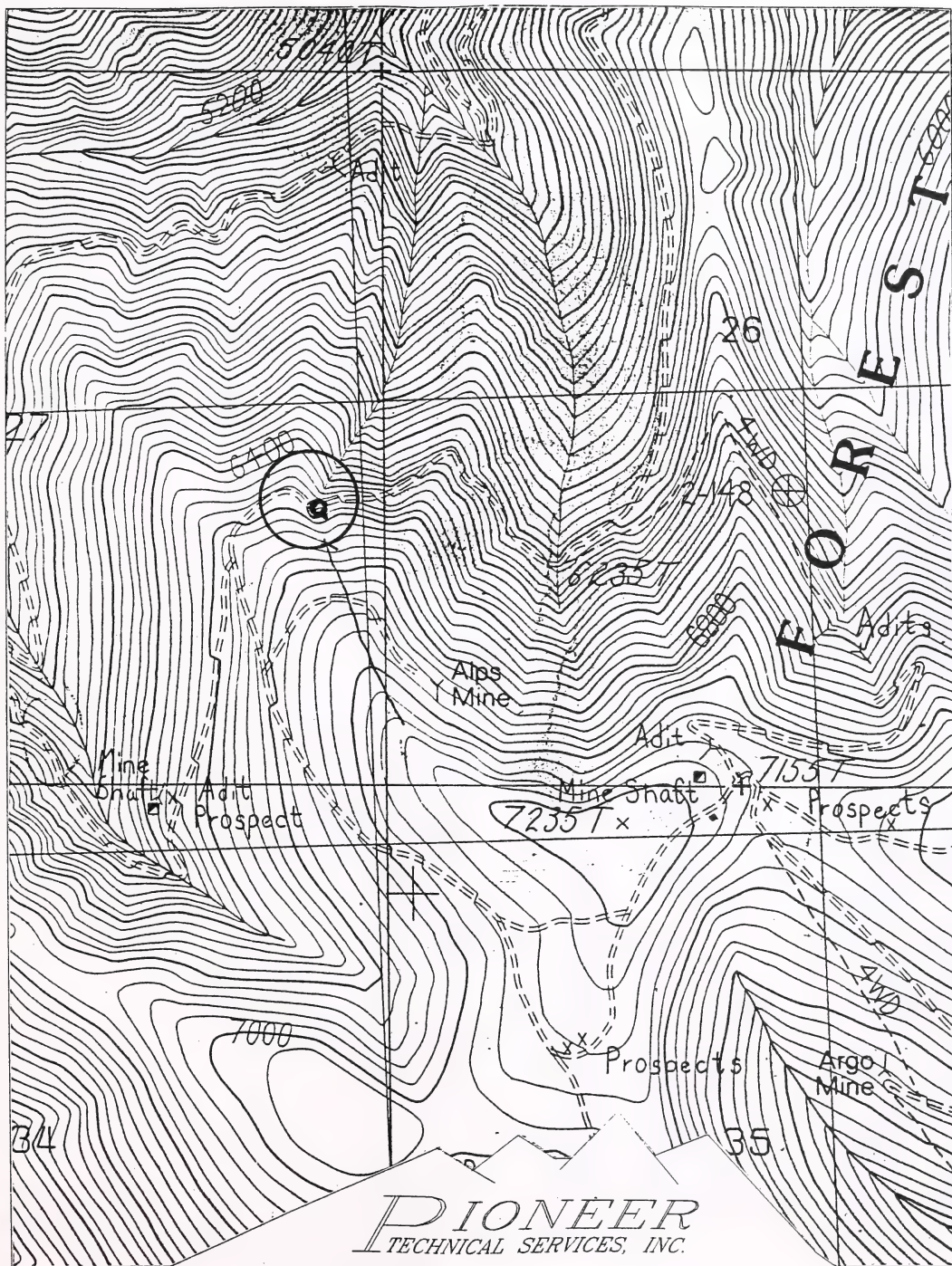
Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

11/01/1993

Well No.	Location	Depth	Yield	Static Water Level
M:131335	10N 16W 35 AD	272.0	35.0	160.00

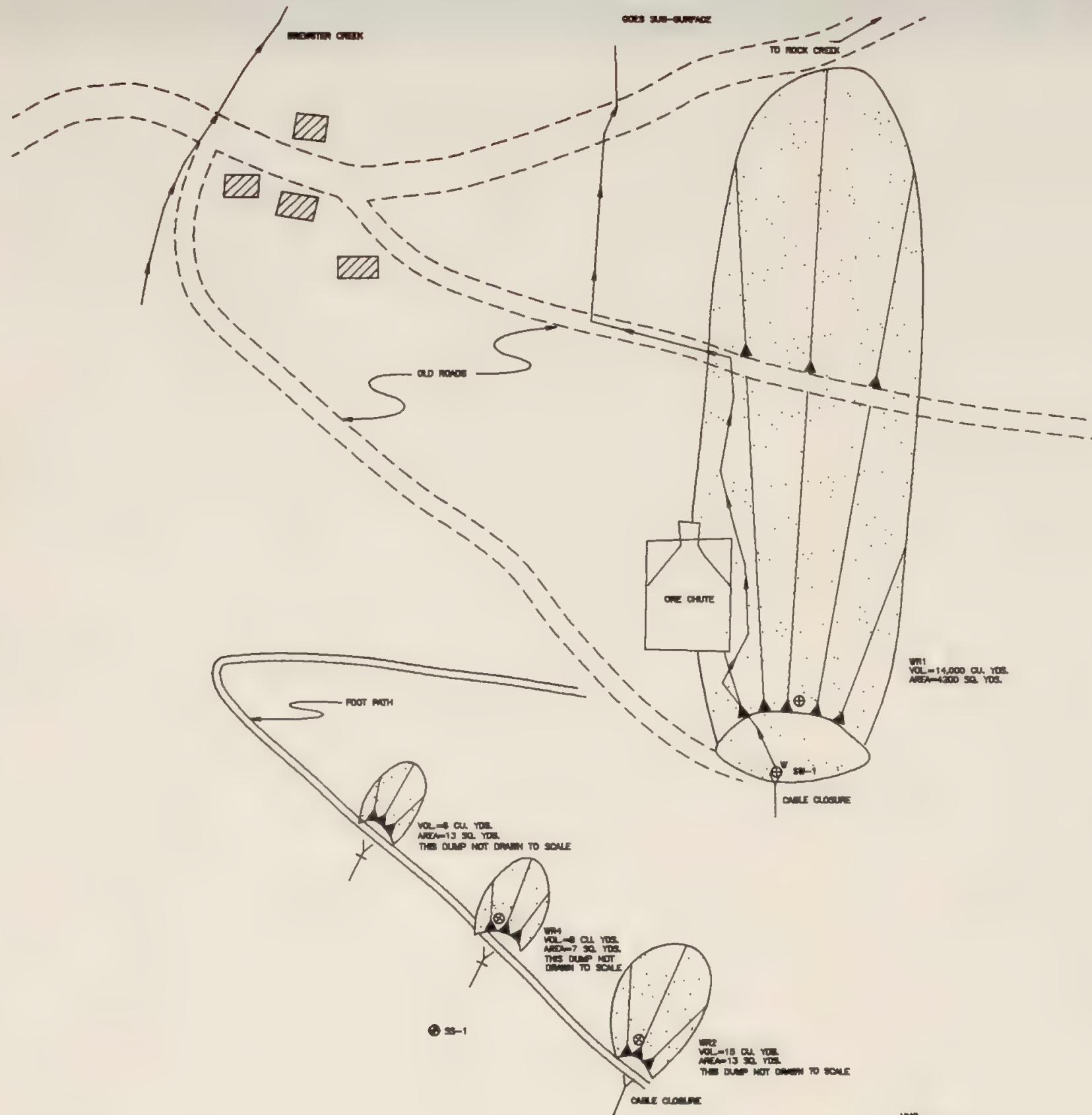


PIONEER
TECHNICAL SERVICES, INC.

ALPS, P.A. NO. 20-065

TION, R16W, SECTION 26

SCALE: 1" = 1000'



SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	⊗	COLLAPSED ADIT
⊙	UTILITY POLE	⊗	OPEN SHAFT
●	DECIDUOUS TREE	⊗	COLLAPSED SHAFT
⊙	CONIFEROUS TREE	⊗	EXCAVATION
—	WOOD FENCE	⊗	WHITE ROCK DUMP
—	WIRE FENCE	⊗	COLLAPSED TIMBERS
▨	BUILDING	—	RAILS
○	BARRIER POST	⊕	XRF SAMPLE
∧	GATE	⊕	WATER SAMPLE
---	EDGE OF ASPHALT	⊕	GROUND AND SURFACE
---	EDGE OF GRAVEL	—	DRAINAGE
▲	SLOPE DIRECTION	●	WATER WELL
⬆	TAILINGS POND	—	PONDED WATER
		⬆	VEGETATED WET LANDS

1860
SHAFT
10'x10'x80' DEEP

PIONEER
ENGINEERING

DATE 14 OCT 83
JOB NO. 83-17
DRAWN JTP
DESIGNED JTP
APPROVED JTP

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS—BOZEMAN—KALISPELL
MONTANA
SPokane

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
ALPS ? PA# 20-065
ALPS DISTRICT GRANITE COUNTY

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay):
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SAMPLERS: Babits, Pierson

[illegible]

p-Direct reading (Kelvey Meter); 3-Saturated Paste (Orlon Meter)

Comments or deviations from SOPs: 20-065-WR-1 is composite of WR-1 and -2.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No , Number: 1 Identification: Adit at
WR-1 discharges

Filled shafts: Yes , No X, Number: Identification:

Seeps/Springs: Yes X, No , Number: Identification: Seeps
appear along road

Groundwater wells within 4 miles?: Yes X, No ;
Number of well logs: 70

Distance to nearest well used for drinking? 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh
(meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable , Possible X, Unlikely .

Uncontained sources with lots of springs and seeps.

Other observations/notes: N/A

SAMPLERS: Babits, Pierson

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Brewster Creek

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes X, No , Name(s)/Description: Seeps

Waste materials within any floodplain: Yes , No X Source ID(s):

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 15 gpm during sampling
High Flow: 100 gpm, Average Flow: 15 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0.125 mile

Surface water draining onto or through waste sources: Yes X, No ,
Describe: Adit discharge drains through WR-1, but does not have a
clear (disappears underground) surface water route to Brewster Creek;
probably a groundwater to surface water route.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, wetland, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes ,
No X, Distance downstream (ft)? Describe/explain (Note streambank
stability and condition of streambank vegetation and any manmade structures or channel changes present):
Brewster Creek looks healthy (vegetation, plants, etc.) in the site
vicinity.

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes X, No , Describe: Brewster Creek; far from the site

Carbonate rocks/soils: Yes , No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 X;
100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 1 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

SAMPLERS: Babits, Pierson

[illegible]

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X, Describe: _____

Population within 1 mile: 1-10 X; 10-30____; 30-100____; 100-300____; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____; Comments _____

Evidence of recreational use on site: Yes____, No X, Describe: _____

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes____, No X, Comment _____
Wilderness Area - Yes____, No X, Comment _____
T&E Species Habitat - Yes X, No____, Comment Peregrine Falcon
Bat Habitat - Yes____, No X, Comment _____

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality - High____, Medium X, Low____
Wetlands Frontage - High X, Medium____, Low____
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 3, types and locations:____
One shaft east of WR-2 and two adits

Hazardous structures: Yes X, No____, Number 4, types and locations:____
Cabins at road

Unstable highwalls, pits, trenches, slopes: Yes____, No X, Number____, types and locations: _____

Unstable waste piles, impoundments, undercut banks: Yes X, No____, Number 1, types and locations: WR-1 is sloughing to road.

Fire and/or Explosion hazards: Yes____, No X, Explain: _____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Alps, Prepared by Northern Engineering and Testing, June 16, 1987.

USGS, Topographic Map, Spink Point, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

ALPS
PA NO. 20-065

Alps PA# 20-065
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 06/30/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-065-WR-1	51 JX	287	0.4 U	1 U	0.8 U	4.6	29000 J	0.159	140 J	2 J	6 J	3 U	10 J	NR
20-065-WR-2	63 JX	961	0.4 U	2.6 J	1.6 J	7.9	99700 J	0.355	1390 J	12 J	16 J	3 U	16 J	NR
BACKGROUND	19 JX	415	0.6 U	2.4 J	4.6 J	5.6	17300 J	0.067	985 J	8 J	12 J	4 U	26 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			SULFUR			PYRITIC SULFUR			PYRITIC SULFUR			SULFUR		
	%	ACID BASE	POTENT.	%	ACID BASE	POTENT.	%	ACID BASE	POTENT.	%	ACID BASE	POTENT.	%	ACID BASE	POTENT.
20-065-WR-1	0.14	4.37	-0.4	0.11	4.8	-15.	<0.01	0.03	0	0.038 U	0.03	0	0.038 U	0.03	0
20-065-WR-2	0.52	16.2	1.01	0.07	1.01	-15.	0.06	0.39	1.87	0.06	0.39	1.87	0.06	0.39	1.87

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. Zn (mg CaCO ₃ /L)
20-065-GW-1	4.22 J	65.2 JX	2.57 U	9.7 U	6.83 U	1.55 U	4930	0.038 U	1130	12.7 U	1.36	30.7 U	14.1	40.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N CYANIDE
20-065-GW-1	109 <	5.0	62 <	0.05 NR

LEGEND

WR1 - Composite of all samples WR1 and 2.

WR2 - Sample of the subsample WR4.

BACKGROUND - Approx. 100 feet above waste rock dump 4.

From the Alps Mine (20-065-SS-1).

GW1 - Discharging adit at waste rock dump 1.

XRF ANALYSIS RESULTS

**ALPS
PA NO. 20-065**

Mine Name: Alps PA# 20-065
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-065-SS-1		27076.5	3646.56	2833.28		833.827 *	20585.5				69.2306 *	41.2518
20-065-WR-1		26982.3	1209.6	1871.84		489.741 *	57225.1				167.133	
20-065-WR-1-COMP		27801.4	1076.79	2002.02	209.338 *	328.01 *	52312.6				149.438	
20-065-WR-2		25924.3	1070.03	1689.3			39603				121.09	17.3782 *
20-065-WR-4		21086.8	1238.02	1324.04	196.907 *	1684.05 *	202500			106.168 *	239.16	10.9753 *
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-065-SS-1	364.621				153.571			773.811			10.8749	
20-065-WR-1	303.098		8.53666 *		131.205			572.866			8.96084 *	
20-065-WR-1-COMP	281.571		9.91851 *		138.454						9.27604	
20-065-WR-2	289.705				119.76	170.74 *		2320.03			9.80424	
20-065-WR-4	228.1		11.8989 *		95.3672			4078.68	155.752 *		5.32262	

* - Estimated Quantity

\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

ALPS
PA NO. 20-065

AIMSS SCORESHEET

SITE NAME:

ALPS

PA NUMBER:

20-065

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.521
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		69
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	71.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	14901
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.640
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	23
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	589
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.005
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	45
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	11
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.003
40	DIRECT CONTACT	POPULATION - 1 MILE		1
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	1
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	0
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			
	(LINES 10 + 24 + 35 + 44) / 100,000			0.16

LINE NO.	SITE NAME: PA NUMBER:			ALPS 20-065
	SITE SAFETY			
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	160
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	360
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	1
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	7.20



20-065, #14: Discharge from Adit #1 dissipating over WR-1



20-065, #13: Adit discharge at WR-1



20-065, #15: Cabins on road

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: SILVER KING PA#: 20-186

Date: June 30, 1993 Time: 0945

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer
Clark, Pioneer

Visitors: Earl McCurley, MDSL
Dan Flunarty, Lessee
Marshal Mulchmore, Lessee

Weather/Seasonality Observations: Sunny to partly cloudy; breezy
in afternoon; 65°F.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #10: Open stope
between Adit #4 and #5; #11: WR-6, looking south; #12: Adit #5;
#13: WR-5 on far right of picture, open stope on left, facing
south; #14: Adit #4, facing south; #15: Portion of WR-4, facing
south; #16: Adit #3; #17: Adit #2, steel door; #18: WR-2, facing
south; #19: WR-3, facing south; #20: WR-1B in foreground, SP-1A and
SP-1B in background, looking west; #21: WR-1A smoothed cut below
trailer and Sluice Gulch; #22: Settling pond at toe of WR-1B
looking west; #23: Adit #1, looking south; #24: WR-7 and Adit #7,
looking north. Video Tape No. 4

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Standard
reclamation techniques to stabilize and revegetate waste rock
dumps. Grate stope between Adits #4 and #5; close adits no longer
in use.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): SILVER KING PA#: 20-186

Legal Description: T 6N ; R 15W ; Sec. 5 , NE1/4 1/4 1/4

County: GRANITE Mining District: ANTELOPE CREEK

Latitude: N 46° 18' 05" Longitude: W 113° 30' 00"

Primary Drainage Basin and Code: Rock Creek/1701202

Secondary Drainage Basin: Sluice Gulch

USGS Quadrangle map name(s): Cornish Gulch

Mine Type/Commodities: Hardrock/Silver, Gold

Activity Status: Active , Inactive/Exploration X , Abandoned .

Ownership status: Known Y X N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Charles Byam,

P.O. Box 640, Philipsburg, MT 59858. (406) 859-3593; Burnett

Mensi, 1000 Corral Road, Prescott, AZ 86303. (602) 778-2153.

Relationship to other mines/sites in the area/district: Downstream of Lori #13

Regulatory Status (Activity by other agencies)? Hardrock permits?

Past Reclamation Activities? N/A

General site features: Elevation 5240' , Slope 25° , Aspect Northwest

Land use: Mining X , Recreational X , Residential , Urban , Agricultural X , Other (Specify)

Area of disturbed/unvegetated lands? Approx. 3 acres.

Dimensions:

Predominant vegetation types: Douglas fir, juniper, cottonwood, thistles, blue bunch wheat grass

Access: roads - good X , poor , 4wd , trail .

Other logistical considerations (proximity to other sites). Good to the lower workings.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 5 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies just west of Sluice Gulch, which drains west into Rock Creek approx. 1/4 mile away; Rock Creek flows north. Groundwater in the area is site specific ranging from 20 to 200 feet. Area is underlain by Precambrian sediments, deposit is along a north trending fault. The sediments in Silver King area are underlain by an intrusive.

Mining/milling history, ore type/tenor, host rock, gangue: Ore deposit is associated with a north trending structure. Host rock is Precambrian sediments underlain by an intrusive; some skain is evident at contact. Ore minerals include chalcopryrite, arsenopyrite, azurite, malachite, and siderite. Gangue is calcite, barite, and quartz.

Mine Operation?

Shafts - Yes ☐, No ☒, # , Comment
Adits - Yes ☒, No ☐, # 7, Comment 5 open; 1 collapsed; 1 secure with metal door.
Pits - Yes ☐, No ☒, # , Comment
Placers - Yes ☐, No ☒, # , Comment
Other - Yes ☐, No ☒, # , Comment

Mill Operation? Yes ☒, No ☐. If yes answer the next three questions:

Period(s) of Operation: 1976 to Unknown - milling occurred at an off-site facility.

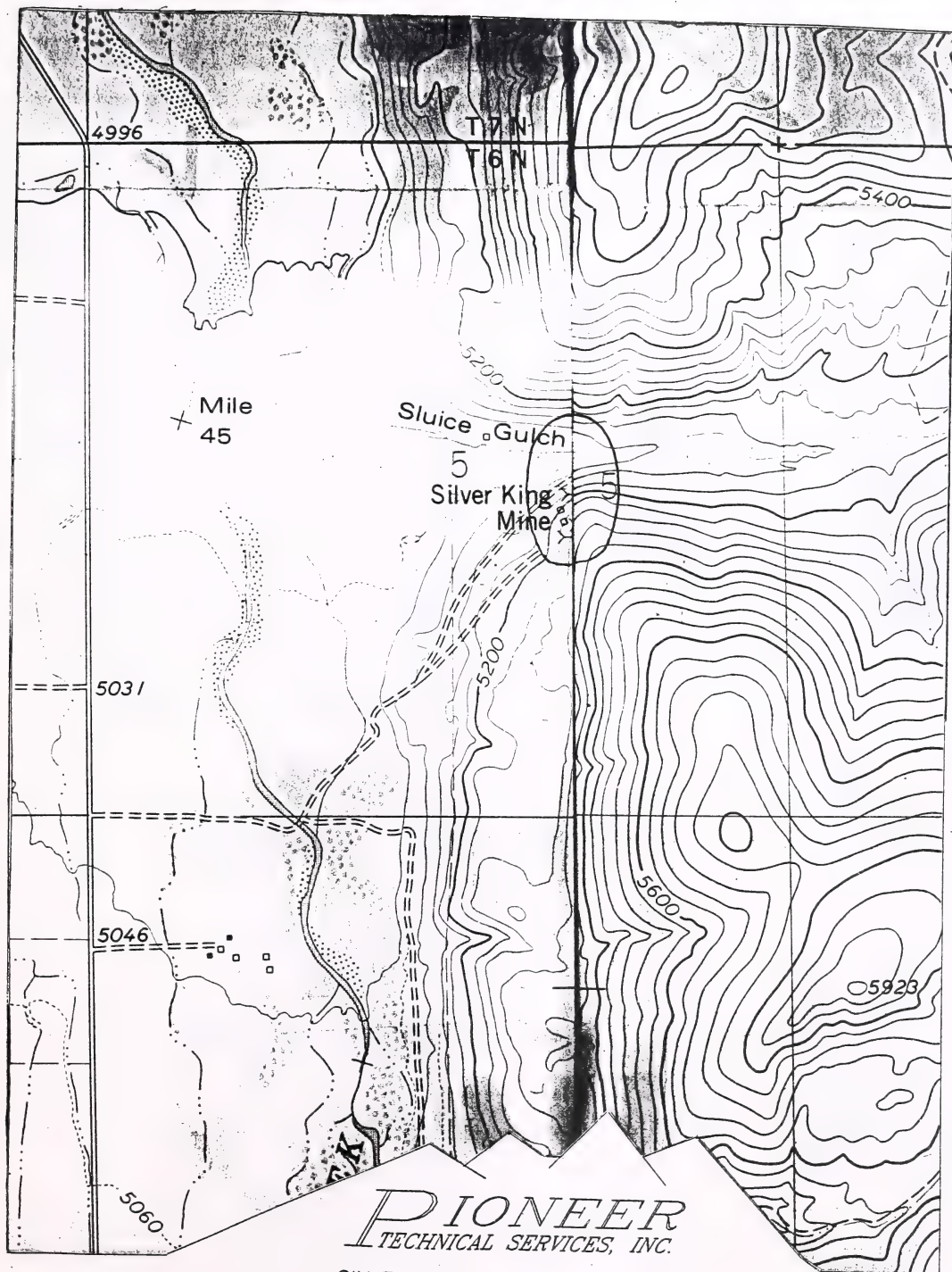
Origin of Ore Milled - Custom Mill ☒ Dedicated Mill ☐; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? CN- leach heap for Au and Ag beginning in 1976; cyanide leaching facility is located 3 miles northwest at McDonald Meadows, just west of Gillies Bridge.

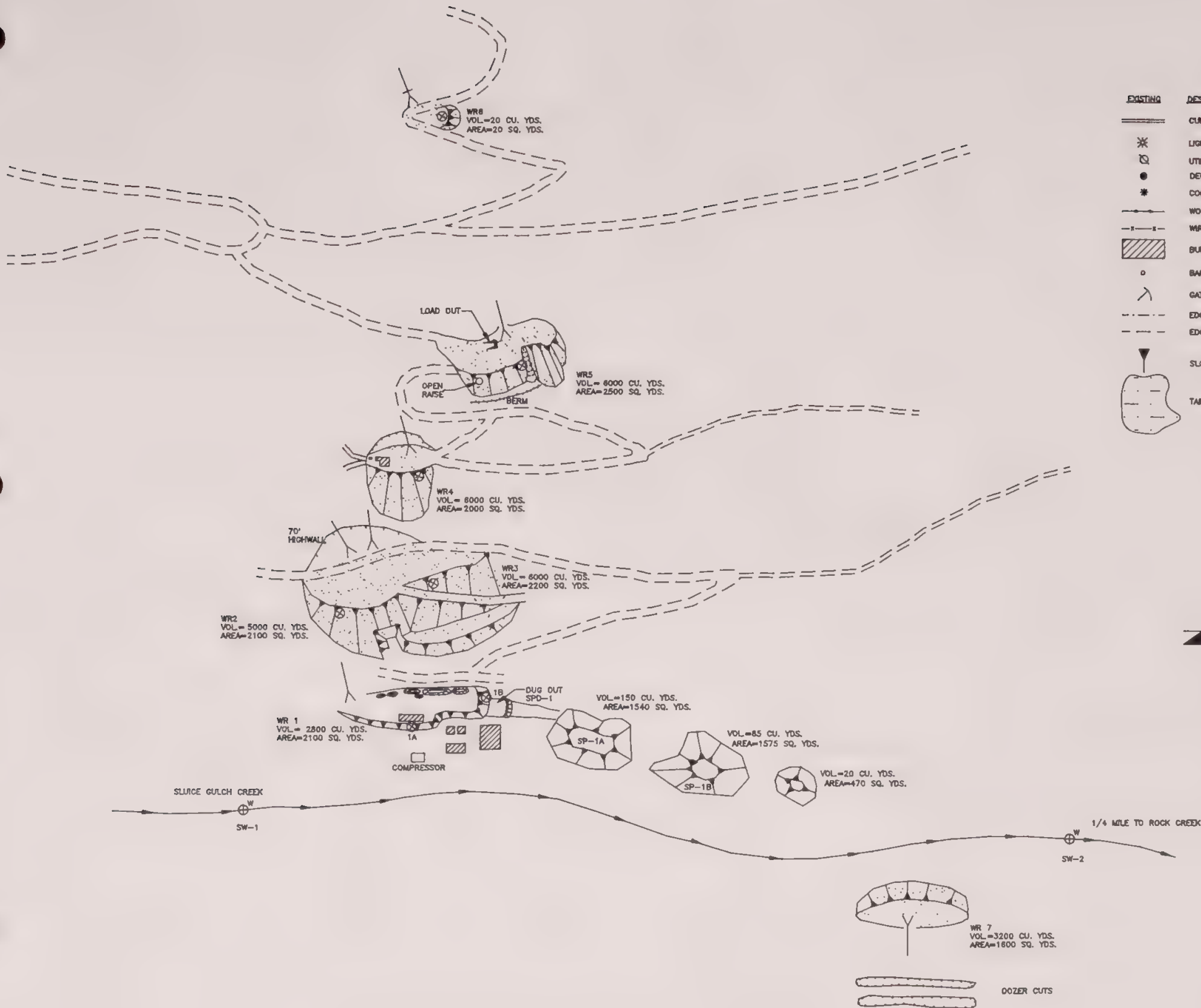
Montana Bureau of Mines and Geology
Water Well Log Data

11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M:53644	06N 15W 06 AA	33.0	20.0	17.00
M:130184	07N 15W 31 BD	30.0	45.0	6.00
M:55992	07N 15W 31 BD	40.0	45.0	16.00
M:55993	07N 15W 31 BDDD	31.0	25.0	17.00
M:55994	07N 15W 31 CAAA	31.0	25.0	21.00







MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

SILVER KING PA# 20-186
ANTELOPE CREEK DISTRICT GRANITE COUNTY

DRAWN JTP DATE 15 OCT 93
DESIGNED JPR JOB NO. 93-17
APPROVED WJB F.B. NO.

PIONEER
TRUCKING SERVICES, INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
MONTANA
SPokane WASHINGTON

1

SHEET NO.

1

20-186.DWGS SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Flammang

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)	RADIO-ACTIVITY (MR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	2,800	East of trailer, on bank of dump approx. 10 feet from Sluice Gulch	None	4.1 (D)	0.04	20-186-WR-1	06/30/93 1500	T-Metals, ABA
WR-1B	WR		On dump south of metal shed on lower level, near center of west slope	None	6.8 (D)	0.04			
WR-2	WR	5,000	Slightly east of Adit #2	None	6.6 (D)	0.05			
WR-3	WR	6,000	Just west of Adit #3	None	6.55 (D)	0.05			
WR-4	WR	6,000	West of Adit #4	None	6.6 (D)	0.04	20-186-WR-4	06/30/93 1400	T-Metals
WR-5	WR	6,000	West of Adit #5	None	6.55 (D)	0.05			
WR-6	WR	20	North of Adit #6 near top of hill	None	6.65 (D)	0.05	N/A	N/A	XRF Analysis
WR-7	WR	3,200	Across valley to north from main Silver King area	None	6.3 (D)	0.05	N/A	N/A	XRF Analysis
SP-1A	WR	150	First outlying pile west of WR-1B, hole on east side	None	6.2 (D)	0.03	20-186-SP-1	06/30/93 1325	T-Metals, ABA
SP-1B	WR	85	Second outlying pile west of WR-1B, hole on east side	None	6.8 (D)	0.04			
SPD-1	SS	N/A	Soil immediately adjacent to WR-1B on west side	Small dam at base	5.7 (D)	0.04	N/A	N/A	XRF Analysis

D: Direct reading (calving Meter); S: Submersed Probe (OxIon Meter)

Comments or deviations from SOPs: 20-186-WR-1 is composite of WR-1A and -1B, WR-2, and WR-3. 20-186-WR-4 is composite of WR-4 and WR-5. 20-186-SP-1 is composite of SP-1A and -1B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No , Number: 1 Identification: Adit #1;
adit was pumped by lessees during site visit; when abandoned it even-
tuallly flows on its own, but is currently drawn down.

Filled shafts: Yes , No X, Number: Identification:

Seeps/Springs: Yes , No X, Number: Identification:

Groundwater wells within 4 miles?: Yes X, No ;
Number of well logs: 30

Distance to nearest well used for drinking? < 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh
(meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable X, Possible , Unlikely .

Groundwater from Adit #1 contains slightly elevated levels of Cu and Mn.

Other observations/notes: Lessees are presently pumping Adit #1 to
access workings. Water is pumped through a pipe and is drained onto
relatively undisturbed ground past the edge of WR-1A. During site
visit, water pooled and puddled on the property; during more extended
pumping operations (Lessees mentioned that they did) water could flow
into Sluice Gulch, approx. 10 feet north of pipe outlet or flow to
Rock Creek approx. 1/4 mile away (west).

SAMPLERS: Bullock, Flammanq

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Sluice Gulch is adjacent to site; Rock Creek is 1/4 mile west of site.

Dry streambeds: Yes X, No , Name(s): Unnamed dry drainage cuts west end of site.

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): WR-1, SP-1A, SP-1B

Approximate Flood frequency? 1 yr, 10 yr, X 100 yr

Estimated seasonal flow of stream(s) (cfs)?
High Flow: 5 cfs, Average Flow: 0.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? WR-1A is approx. 5 feet from the edge of Sluice Gulch in a few places.

Surface water draining onto or through waste sources: Yes , No X,
Describe: Precipitation runoff only.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, riparian, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes ,
No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): None observed during this investigation.

SAMPLERS: Bullock, Clark

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Flow was only measured at downstream location due to adit not being pumped at time of investigation.

(

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approximately 15 acres of broad flat valley bottomland present between the Mine and Rock Creek.

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes X , No , Describe: A few in gangue rock.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100 X;
100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or
greater___; Comments

Nearest residence(ft or miles)? Approx. 1/2 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Flammang

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (PERCENT)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3	Dry	18,900	15,120	Yes	Low
WR-2	None	Dry	18,900	4,725	No	None
WR-3	None	Dry	19,800	18,810	No	Low
WR-4	None	Dry	18,000	17,100	No	Low
WR-5	None	Dry	22,500	21,825	No	Low
WR-6	None	Dry	180	144	No	None
WR-7	None	Dry	16,200	12,150	Yes	Low
SP-1A	SO3	Dry	13,860	13,860	Yes	Moderate
SP-1B	SO3	Dry	14,175	14,175	Yes	Moderate

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No ,
Describe: Lessees visit site at least once a week

Population within 1 mile: 1-10 X; 10-30 ; 30-100 ; 100-300 ;
300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ;
Comments

Evidence of recreational use on site: Yes X, No , Describe: Beer cans

Accessibility - Fences, warning signs, closed roads? Locked gate

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes , No X, Comment
Wilderness Area - Yes , No X, Comment
T&E Species Habitat - Yes X, No , Comment Peregrine Falcon
Bat Habitat - Yes X, No , Comment Open adits

Primary Drainage X; Secondary Drainage ; No Information :

Riparian Habitat Quality - High , Medium X, Low
Wetlands Frontage - High X, Medium , Low
Fisheries Habitat and Species Classification - 3
Sport Fishery Classification - 1

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No , Number 7, types and locations:
Adit #1 has wood door; Adit #2 has metal door; Adit #3 is open; Adit #4 has a few boards over it, but otherwise open; Adit #5 has an open gate; Adit #7 has a few boards over it; Stope very hazardous between Adit #4 and #5. All openings are large.

Hazardous structures: Yes X, No , Number 1, types and locations:
Building located by Adit #4

Unstable highwalls, pits, trenches, slopes: Yes , No X, Number , types and locations:

Unstable waste piles, impoundments, undercut banks: Yes X, No , Number 2, types and locations: WR-5 near stope is slumping into stope above it. WR-4 on west end has steep slopes and collapsed area

Fire and/or Explosion hazards: Yes , No , Explain:

Bibliography

- AEPCO, Inc., Preliminary Assessment Report for Sluice Gulch Leaking Mine Adit, Philipsburg, Granite County, Montana, BLM Site Code: MT 01411A0004 (Final Report), Executive Summary, 1986.
- MBMG, Silver King Mine, Granite County, Form 39, 1970-1986.
- MBMG, State Technical Services Mine Visit Report for Silver King, Prepared by M. Hansen, February 23, 1971.
- MBMG, Well Log Database, September 8, 1993.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Silver King Mine, Prepared by Northern Testing and Engineering, September 14, 1988.
- Mining Record, The, Two Montana Gold & Silver Firms Join Forces, Volume 93, No. 39, August 26, 1981.
- Spokane (WA) Daily Chronicle, Northwest Gold, Firm to Acquire Montana Assets, August 7, 1981.
- Spokane (WA) Daily Chronicle, Northwest Gold, Issue Oversubscribed, May 19, 1981.
- USGS, Topographic Map, Cornish Gulch, Montana, 7 1/2 minute Quadrangle, 1975.

LABORATORY ANALYTICAL DATA

SILVER KING
PA NO. 20-186

Silver King PA# 20-186
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/30/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-186-SP-1	575 JX	465	0.5 U	2.2 J	4.4 J	122	22900 J	1.47	365 J	6 J	43 J	80 J	23 J	NR
20-186-WR-1	444 JX	214	0.6 U	6.4 J	6.8 J	287	44500 J	2.27	1440 J	13 J	89 J	99 J	56 J	NR
20-186-WR-4	450 JX	718	0.6 U	6.9 J	12.7 J	185	47600 J	4.9	407 J	17 J	137 J	269 J	42 J	NR
BACKGROUND	11 J	267	1.7	11	8.7	7.8	12800	0.08 JX	250	9	15	5 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	U/1000t	%	U/1000t	%	U/1000t	%	U/1000t	%	U/1000t	%	U/1000t	%	U/1000t	%	U/1000t
20-186-SP-1	0.11	3.44	2.08	-1.4	0.05	0.02	0.04	0.62	1.46							
20-186-WR-1	3.22	101	46.7	-54	0.54	2.13	0.55	66.5	-19.8							
20-186-WR-4	0.4	12.5	0.84	-12	0.38	<0.01	0.03	0	0.84							

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)
20-186-GW-1	6.95 J	7.83 JX	2.57 U	9.7 U	6.83 U	197 J	273	0.038 U	901	12.7 U	1 U	30.7 U	86.9
20-186-SW-1	15.1 J	58.2 JX	2.57 U	9.7 U	6.83 U	1.55 U	428	0.038 U	14.8	12.7 U	1.64	30.7 U	7.57 U
20-186-SW-2	14.7 J	56.4 JX	2.7 J	9.7 U	7.97	1.55 U	361	0.038 U	10.4	12.7 U	1 U	30.7 U	7.57 U

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-186-GW-1	402	8.7	144	0.3	NR
20-186-SW-1	182	< 5.0	10	0.12	NR
20-186-SW-2	160	7.7	10	0.12	NR

LEGEND

SP1 - Composite of subsamples SP1A and 1B.

WR1 - Composite of subsamples WR1A, 1B, 2, and 3.

WR4 - Composite of subsamples WR4 and 5

BACKGROUND - From the Montana Price Mine (41-504-SS-1).

GW1 - End of pipe pumping water from adit #1.
SW1 - 100' upstream of adit #1.

SW2 - 100' downstream of last structure to the North.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

XRF ANALYSIS RESULTS

**SILVER KING
PA NO. 20-186**

Mine Name: Silver King PA# 20-186
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-186-SP1-A		9350.02	1759.01	2217.35		505.041 *	31823.1		117.82 *		831.682	7.03666 *
20-186-SP1-B		6294.39	2286.36	2206.6		543.014 *	23232.7		131.863		465.536	6.67749 *
20-186-SPD-1		10342.1	31661.2	1689.8	327.819 *	1588.88	32030.8		235.08	59.9485 *	310.712	42.2548 *
20-186-SP-1-COMP		7385.94	2141.16	2389.63		528.07 *	26870.8		119.306		631.373	8.47973 *
20-186-WR1-A		9748.27	32329.5	1262.65	154.378 *	1017.03	52463.8		321.627	71.7982 *	754.37	30.5762
20-186-WR1-B		13355.5	14044.8	2043.39	236.981 *	789.635	27182.3		167.822	44.7264 *	149.307	75.0435
20-186-WR1-COMP	284.352 *	13908	20235.7	1696.63	213.663 *	898.743	36016.4		180.747	56.1596 *	420.438	64.7495
20-186-WR-2		14957.9	10850.8	1661.55	141.749 *	1127.77	33294.3		126.713	38.7253 *	400.454	33.661
20-186-WR-3		17688.8	15388	1939.94	261.943 *	1156.01	22134.1		79.259 *	103.536	130.359	26.8625
20-186-WR-4		7705.78	5572.05	2182.68		312.479 *	59107.4		303.551	37.6311 *	749.019	10.2022 *
20-186-WR-4-COMP		4526.9	2417.25	2430.48		297.263 *	50712.7		205.176		612.522	13.0238 *
20-186-WR-5		1637.18	2727.11	2460.35		304.464 *	31232.6		86.4594 *		381.134	6.63635 *
20-186-WR-6		7195.64	2665.68	3992.85		1397.5	24719.6		41.095 *		54.1181 *	7.56828 *
20-186-WR-7		12472.4	7384.58	1447.88	171.268 *	1348.95	26102.8		42.9155 *	65.8443 *	73.0191 *	38.1348
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-186-SP1-A	210.029			70.2805	39.6511		377.283	1568.06			15.6593	
20-186-SP1-B	184.688			30.47 *	27.6099		344.684	1314.89			21.2338	
20-186-SPD-1	193.51			55.2216	68.1191		110.98 *	333.003			11.1232	
20-186-SP-1-COMP	225.876			46.328 *	30.7421		323.325	1123.21			23.1879	
20-186-WR1-A	148.996			40.1175 *	93.7304		302.205	342.493			8.66155	
20-186-WR1-B	159.299		4.28362 *	15.9025 *	91.6702		110.949 *	443.808	274.825 *		3.95058	
20-186-WR-1-COMP	157.223			43.3525 *	107.939		281.165	554.261			9.15573	
20-186-WR-2	186.871			70.044	114.051		1145.63	973.178			19.4571	
20-186-WR-3	191.179			32.1247 *	114.732		101.359 *	383.084			17.3169	
20-186-WR-4	224.231		3.48719 *	113.422	54.8397		1274.67	2014.93			22.8296	
20-186-WR-4-COMP	218.824			36.4391	54.8397		1205.74	2267.39			25.0265	
20-186-WR-5	241.894			140.563	8.15495 *		1283.69	2148.76	250.907 *	6.23204 *	33.7249	
20-186-WR-6	281.94			53.7285	53.7285		62.1895 *	977.577		7.42621 *	26.5584	
20-186-WR-7	184.093			55.6899	95.2839		64.7507 *	404.397			14.2793	

* - Estimated Quantity

\$ - Unvaluated Data

**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**SILVER KING
PA NO. 20-186**

AIMSS SCORESHEET

SITE NAME:

SILVER KING

PA NUMBER:

20-186

LINE NO.			PA NUMBER:	20-186:
1		GROUNDWATER PATHWAY		
2		OBSERVED RELEASE		0
3A	GW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
3B		CONTAINMENT		20
3C		GW DEPTH		20
4		POTENTIAL TO RELEASE	LINES 3A x 3B	400
5		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
6	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	16.362
7	GW - TARGETS	WELLS - 1 MI. x 2.5		12.5
8		WELLS - 1 TO 4 MI		25
9		NEAREST WELL		0
10		TARGETS SCORE	LINES 6 + 7 + 8	37.5
		GROUNDWATER SCORE	LINES 4 x 5 x 9	245430
11		SURFACE WATER PATHWAY		
12		OBSERVED RELEASE		0
13A	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13B		CONTAINMENT		20
13C		DISTANCE TO SW		20
14		POTENTIAL TO RELEASE	LINES 13A x 13B	400
15		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
16	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	17.450
17	SW - TARGETS	DRINKING WATER POP'N		0
18		IMPACTED DRAINAGE		0
19		WETLANDS		10
20		FISHERY		5
21		RECREATION		5
22		IRRIGATION/STOCK		2
23		T & E SPECIES HABITAT		5
24		TARGETS SCORE	SUM LINES 16 - 22	27
		SURFACE WATER SCORE	LINES 14 x 15 x 23	188460
25		AIR PATHWAY		
26A	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26B		CONTAINMENT		15
26C		DISTANCE TO POPULATION		10
27		POTENTIAL TO RELEASE	LINES 26A x 26B	150
28		LIKELIHOOD SCORE	LINES 25 + 26C	150
29	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.223
30	AIR - TARGETS	POPULATION - 4 MILES		30
31		NEAREST RESIDENCE		5
32		WETLANDS		10
33		PARKS / WILDERNESS		0
34		T & E SPECIES HABITAT		5
35		TARGETS SCORE	SUM LINES 29 - 33	50
		AIR PATHWAY SCORE	LINES 27 x 28 x 34	1673
36		DIRECT CONTACT PATHWAY		
37A	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		250
37B		ACCESSIBILITY		5
37C		DISTANCE TO POPULATION		10
38		POTENTIAL EXPOSURE	LINES 37A x 37B	50
39		LIKELIHOOD SCORE	LINES 36 + 37C	300
40	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.212
41	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
42		NEAREST RESIDENCE		5
43		RECREATIONAL USE		2
44		TARGETS SCORE	SUM LINES 40 - 42	8
		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	509
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			
	(LINES 10 + 24 + 35 + 44) / 100,000			4.36

LINE
NO.

SITE NAME:

SILVER KING

PA NUMBER:

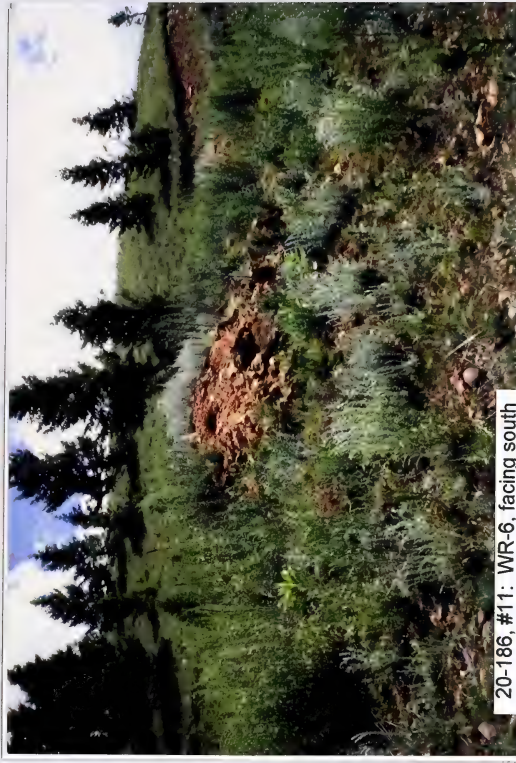
20-186

SITE SAFETY

1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	350
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	390
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	8
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	15.60



20-186, #10: Open slope between Adit #4 and Adit #5



20-186, #11: WR-6, facing south



20-186, #12: Adit #5



20-186, #13: WR-5 (far right) and open slope (left/south)



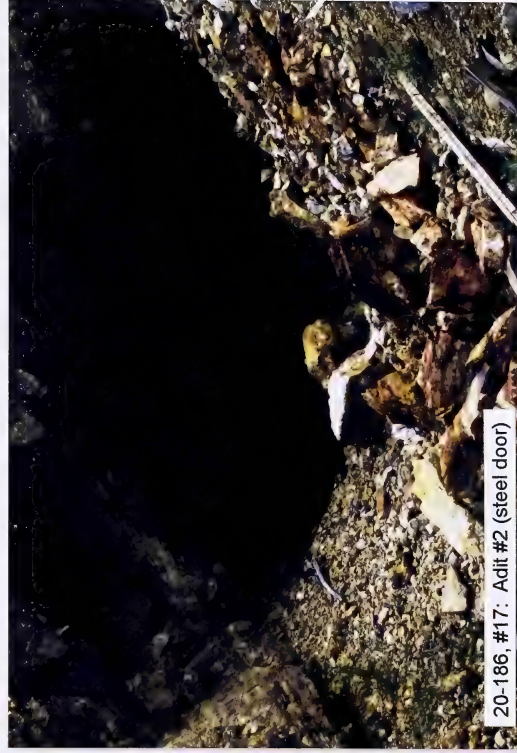
20-186, #14: Adit #4, facing south



20-186, #15: Portion of WR-4, facing south



20-186, #16: Adit #3



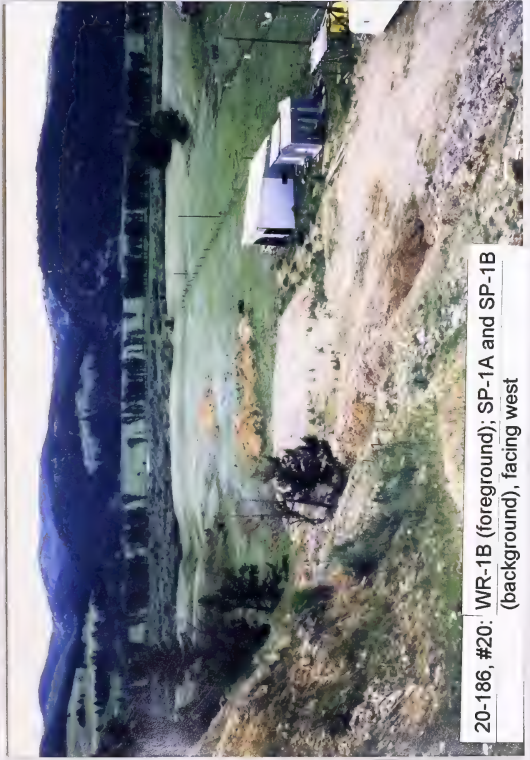
20-186, #17: Adit #2 (steel door)



20-186, #18: WR-2, facing south



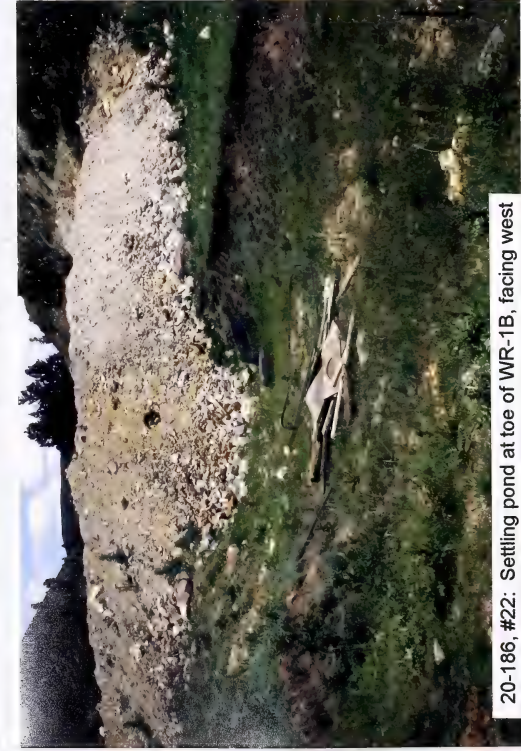
20-186, #19: WR-3, facing south



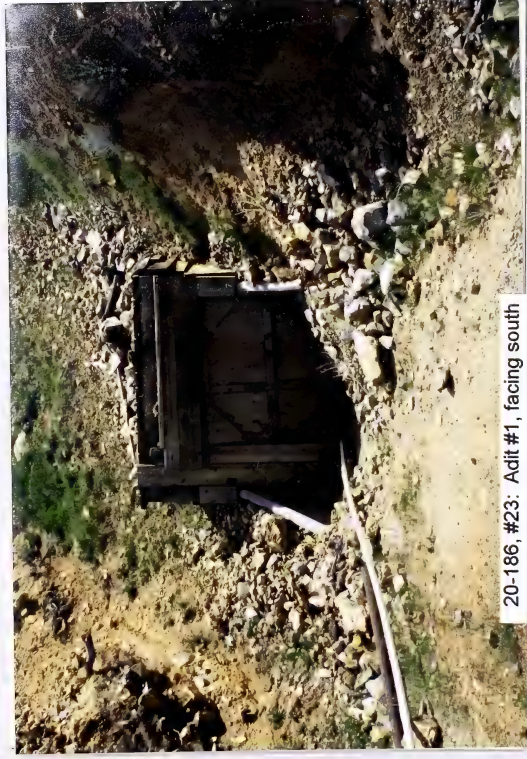
20-186, #20: WR-1B (foreground); SP-1A and SP-1B (background), facing west



20-186, #21: WR-1A



20-186, #22: Settling pond at toe of WR-1B, facing west



20-186, #23: Adit #1, facing south



20-186, #24: WR-7 and Adit #7, facing north

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: LORI NO. 13 PA#: 20-191

Date: September 10, 1993 Time: 0800

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Cool to warm (45° to 60°F);
clear; slight breeze (5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): Photos taken were
misplaced. Video Tape No. 3.

General Comments/Observations (not covered specifically in attached Inventory Forms):
No samples were sent to the lab from this site because waste rock
was small, well vegetated, and the distance to surface water was
800 feet.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: No
reclamation is necessary.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): LORI NO. 13 PA#: 20-191

Legal Description: T 6N ; R 15W ; Sec. 4 , SE1/4 NW1/4 1/4

County: GRANITE Mining District: ANTELOPE CREEK

Latitude: N 46° 18' 17" Longitude: W 113° 29' 00"

Primary Drainage Basin and Code: Rock Creek/17010202

Secondary Drainage Basin: Sluice Gulch

USGS Quadrangle map name(s): Antelope Creek

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active , Inactive/Exploration X , Abandoned .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Joel Kindle,
Box 2200K Riverview Rt., Riverton, WY 82501. (307) 856-1758.

Relationship to other mines/sites in the area/district: The Silver
King is approx. 1 mile downstream on Sluice Gulch. Many prospects
are in the area.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 5400' , Slope 35° ,
Aspect South

Land use: Mining , Recreational , Residential , Urban ,
Agricultural X , Other (Specify)

Area of disturbed/unvegetated lands? 0.1 acres.
Dimensions:

Predominant vegetation types: Sage, thistle

Access: roads - good , poor , 4wd X , trail .
Other logistical considerations (proximity to other sites). One
mile hike to the site; locked gate just prior to the Silver King
site.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Sluice Gulch runs east to west approx. 800
feet to the south of the site. Sluice Gulch flows into Rock Creek
approx. one and one-half miles downstream.

Mining/milling history, ore type/tenor, host rock, gangue: No
information available.

Mine Operation?

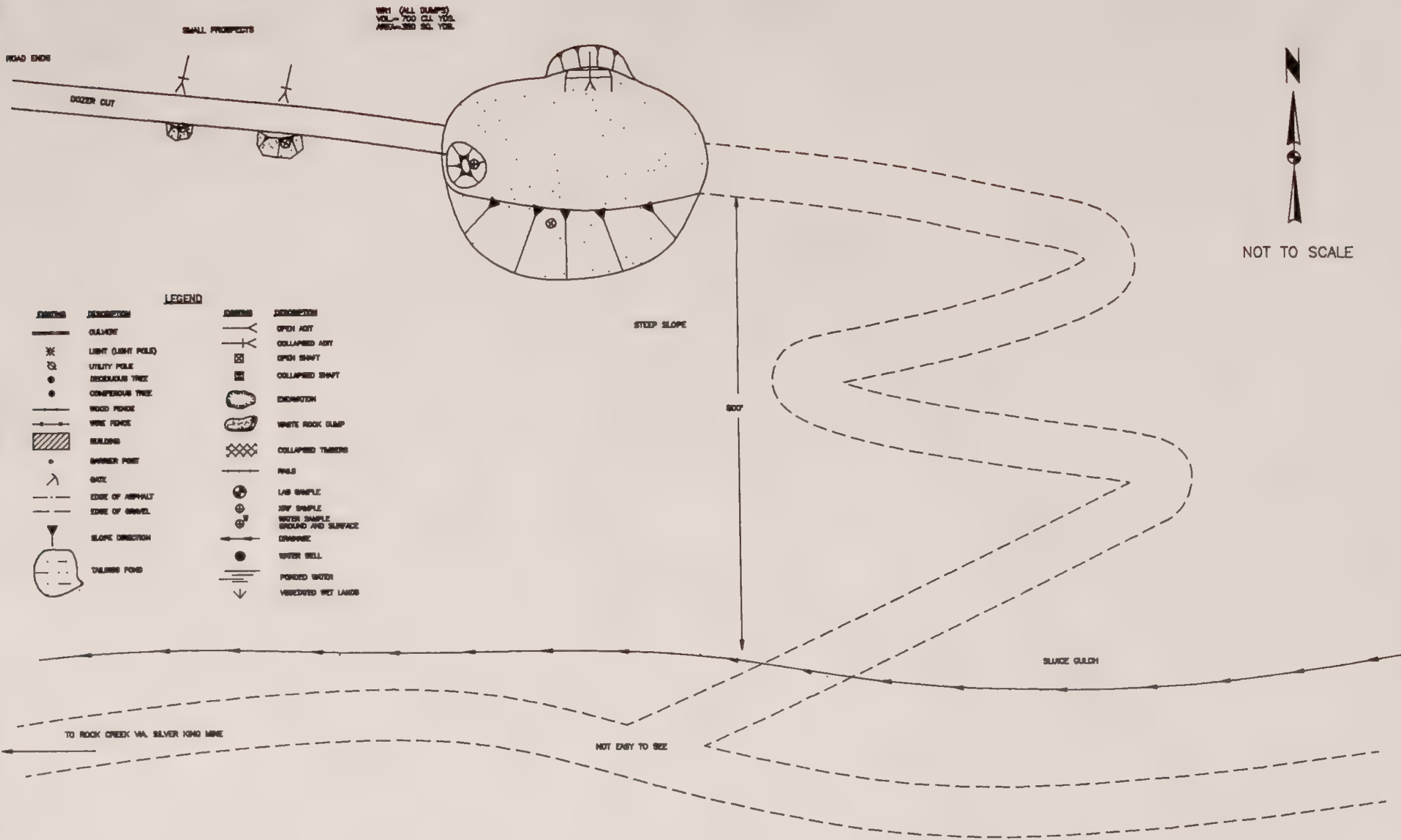
Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 3, Comment 1 open; 2 collapsed
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes , No X. If yes answer the next three
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

LORI #13 PA# 20-191
ANTELOPE DISTRICT GRANITE COUNTY

SHEET NO.

DATE 8 OCT 83
JOB NO. 83-17
F.B. NO.

PIONEER
ENGINEERING & CONSULTANTS

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPokane MONTANA WASHINGTON

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SAMPLERS: Pierson

[illegible]

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: No samples were sent to the lab.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:___

Filled shafts: Yes___, No X, Number:___ Identification:___

Seeps/Springs: Yes___, No X, Number:___ Identification:___

Groundwater wells within 4 miles?: Yes X, No___;

Number of well logs: 24

Distance to nearest well used for drinking? 2.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___; Possible___, Unlikely X.

Very small uncontained source far from surface water.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Sluice Gulch

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes , No X Source ID(s):

Approximate Flood frequency? 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow: , Average Flow:

Distance between waste source(s) and nearest surface water body (ft)? 800 feet

Surface water draining onto or through waste sources: Yes , No X, Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, irrigation, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes , No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): None observed during this investigation.

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO₃)
Presence of evaporative salt deposits? (ESD)
Discolored or turbid seepage? (SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?
Presence of ferric hydroxide precipitates? (FEOX)
Presence of burned or stressed vegetation? (VEG)
pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes , No X, Describe:

Carbonate rocks/soils: Yes X, No , Describe: Limestone

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 X;
100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 2.5 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

SAMPLERS: Pierson

[illegible]

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe: _____

Population within 1 mile: 1-10____; 10-30____; 30-100____; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments None

Evidence of recreational use on site: Yes____, No X, Describe: _____

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment _____
Wilderness Area -	Yes____, No <u>X</u> , Comment _____
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Peregrine Falcon</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage X; Secondary Drainage____; No Information____:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High <u>X</u> , Medium____, Low____
Fisheries Habitat and Species Classification -	<u>3</u>
Sport Fishery Classification -	<u>1</u>

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 1, types and locations:____
Timber frame adit

Hazardous structures: Yes____, No X, Number____, types and locations:____

Unstable highwalls, pits, trenches, slopes: Yes____, No X, Number____,
types and locations: _____

Unstable waste piles, impoundments, undercut banks: Yes____, No X,
Number____, types and locations: _____

Fire and/or Explosion hazards: Yes____, No X, Explain: _____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Lori No. 13, Prepared by Northern Engineering and Testing, September 14, 1988.

USGS, Topographic Map, Antelope Creek, Montana, 7 1/2 minute Quadrangle, 1971.

XRF ANALYSIS RESULTS

**LORI NO. 13
PA NO. 20-191**

Mine Name: Lori #13 PA# 20-191
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-191-WR-1		12467.6	78064.4	953.949	194.925 *	2334.39	39164.6		556.065	110.467 *	122.28 *	68.3524
20-194-WR1-A			14622.7	1851.17	215.843 *	1017.43 *	72769.1	489.49 *			685.126	101.713
20-194-WR1-B			4204.16	473.241 *		1166.59 *	258306				2294.69	35.3367 *
20-194-WR-1-COMP			6528.09	1252.56		1100.08 *	165031				1400.43	71.9721
20-191-WR-1	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-194-WR1-A	202.527			339.204	117.36		239.521	2640.24				
20-194-WR1-B	189.001				94.36			3446.77	120.443 *			
20-194-WR1-B	140.222				85.3323			16575.3				
20-194-WR-1-COMP	146.551				82.529	260.178 *		10738.4	164.254 *			

* - Estimated Quantity

\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

LORI NO. 13
PA NO. 20-191

AIMSS SCORESHEET

SITE NAME:

LORI NO. 13

PA NUMBER:

20-191

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.202
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		24
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	24.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	970
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A	SW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.220
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	27
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	238
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.007
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	45
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	16
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.007
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	0
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			0.01
	(LINES 10 + 24 + 35 + 44) / 100,000			

LINE
NO.

SITE NAME:

LORI NO. 13

PA NUMBER:

20-191

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	50
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	0.00

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ANT PA#: 20-194

Date: September 9, 1993 Time: 1345

Field Team Leader: M. Babits, Pioneer

Sampling Personnel: S. Babits, Pioneer
Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Warm (70°F); clear; slight breeze (5 mph); no rain in one week; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): Photos taken were misplaced. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: No remediation is necessary. Waste rock is minimal and far from surface water. Adit discharge has low pH, but far from surface water; discharge does not have metals above Maximum Contaminant Levels.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ANT PA#: 20-194

Legal Description: T 6N ; R 15W ; Sec. 34 , NE1/4 NE1/4 1/4

County: GRANITE Mining District: ANTELOPE CREEK

Latitude: N 46° 14' 8 or 9" Longitude: W 113° 27' 12"

Primary Drainage Basin and Code: Rock Creek/17010202

Secondary Drainage Basin: South Fork Antelope Creek

USGS Quadrangle map name(s): Potato Lake

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active , Inactive/Exploration X , Abandoned .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): George Mungas,
P.O. Box 236, Philipsburg, MT 59858. (406) 859-3350.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 6550' , Slope 32° ,
Aspect East

Land use: Mining , Recreational , Residential , Urban ,
Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? 0.1 acres.
Dimensions:

Predominant vegetation types: Mullen, fir, thistle, grasses

Access: roads - good , poor , 4wd X , trail .
Other logistical considerations (proximity to other sites). Can
drive to within 1/4 mile, then there is a locked gate.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s)): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). The site is in a dry intermittent drainage of the South Fork Antelope Creek. South Fork Antelope Creek flows south to north approx. 450 feet to the northeast of the site.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?

Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 6, Comment 4 open
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

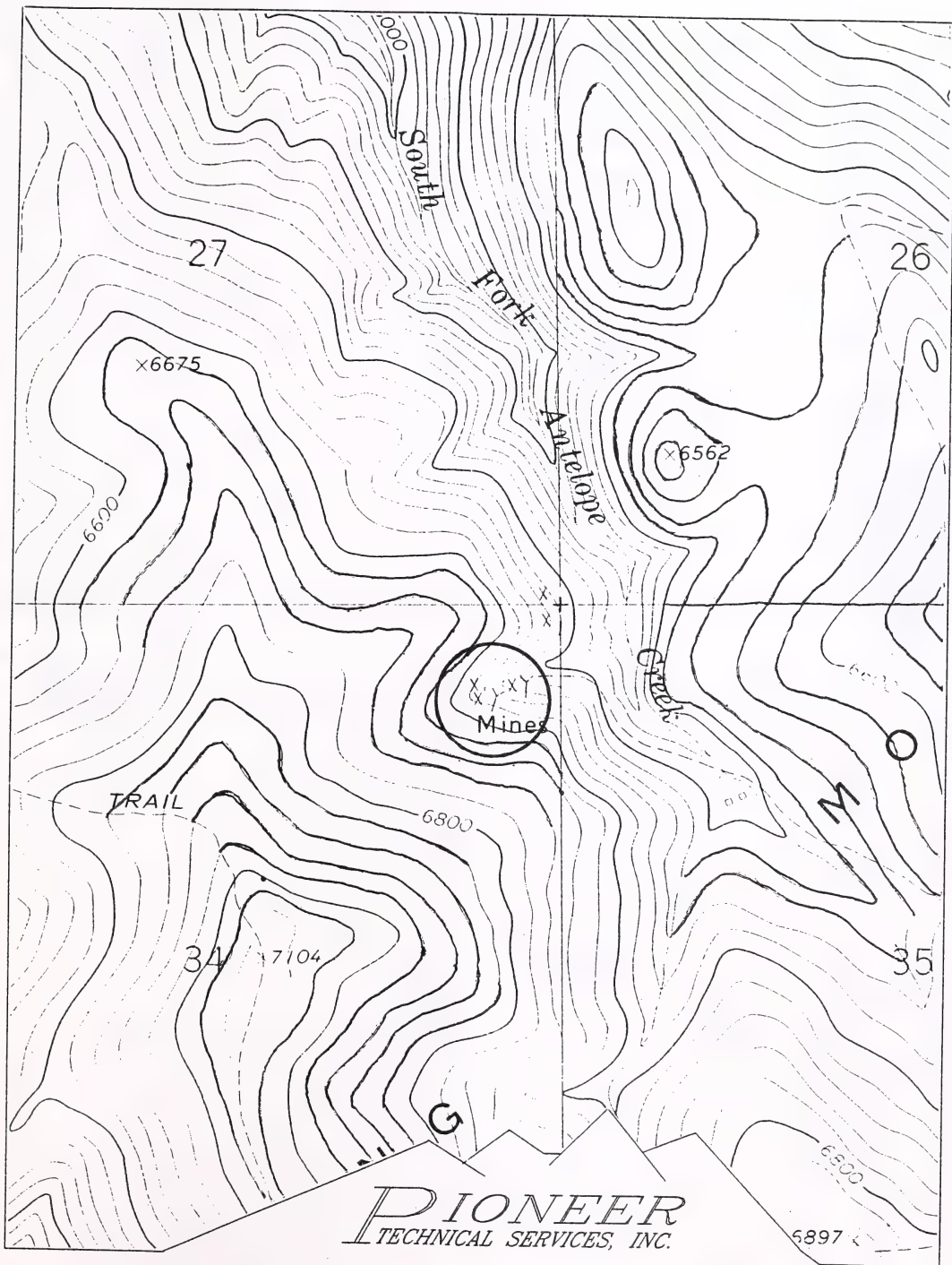
Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

11/15/1993

Well No.	Location	Depth	Yield	Static Water Level
53653	06N 15W 33	46.0	0.0	20.00

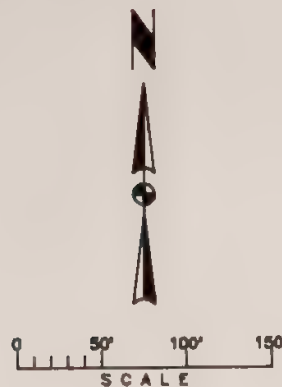


PIONEER
TECHNICAL SERVICES, INC.

ANT, P.A. NO. 20-194

T06N, R15W, SECTION 34

SCALE: 1" = 1000'



NUMEROUS OTHER
ROADS IN AREA

AREA-63 SQ.YDS.
VOL.=18 CU.YDS.

VOL.=20 CU. YDS.
AREA=61 SQ.YDS.

DRY DRAINAGE

SR-1
(PONDED WATER IN ADIT)

WR1
VOL.=2300 CU. YDS.
AREA=870 SQ. YDS.

DRY DRAINAGE

ROAD BACK TO
CURBING AT
LOCKED GATE

SOUTH FORK
ANTELOPE CREEK

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
□	UTILITY POLE	□	OPEN SHAFT
●	CENTERLINE MONUMENT	□	COLLAPSED SHAFT
●	DECIDUOUS TREE	○	EXCAVATION
●	CONIFEROUS TREE	○	WHITE ROCK DUMP
—	WOOD FENCE	⊗	COLLAPSED TIMBERS
—	WIRE FENCE	—	RAILS
▨	BUILDING	●	LAB SAMPLE
○	BARRIER POST	⊕	XRF SAMPLE
∧	GATE	⊕	WATER SAMPLE
- - -	EDGE OF ASPHALT	⊕	GROUND AND SURFACE
- - -	EDGE OF GRAVEL	→	DRAINAGE
▼	SLOPE DIRECTION	●	WATER WELL

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

ANT PA# 20-194
ANTELOPE CREEK DISTRICT GRANITE COUNTY

SHEET NO.

PIONEER
ENGINEERING

TDSH

DRAWN JTP DATE 8 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED MUR F.B. NO.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPOKANE MONTANA WASHINGTON

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SAMPLERS: Pierson

[illegible]

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-194-WR-1 is composite of WR-1A and -1B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No , Number: Identification: Adit discharge at WR-1

Filled shafts: Yes , No X, Number: Identification:

Seeps/Springs: Yes , No X, Number: Identification:

Groundwater wells within 4 miles?: Yes X, No ;
Number of well logs: 39

Distance to nearest well used for drinking? 2.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable , Possible , Unlikely X.

Very little source material; adit discharge has low pH that is far from surface water.

Other observations/notes: N/A

SAMPLERS: Babits

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes , No X, Name(s):

Dry streambeds: Yes X, No , Name(s): Unnamed dry intermittent drainage

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes , No X Source ID(s):

Approximate Flood frequency? 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow: , Average Flow:

Distance between waste source(s) and nearest surface water body (ft)? 450 feet between WR-1 and South Fork Antelope Creek (10 gpm).

Surface water draining onto or through waste sources: Yes , No X, Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Agriculture

Observed erosional/sedimentation/stream turbidity problems? Yes , No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO₃)
Presence of evaporative salt deposits? (ESD)
Discolored or turbid seepage? (SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?
Presence of ferric hydroxide precipitates? (FEOX)
Presence of burned or stressed vegetation? (VEG)
pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres

Wetlands present: Yes , No X, Describe:

Carbonate rocks/soils: Yes , No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 X;
100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 2.5 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

SAMPLERS: Babits

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe:

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments None

Evidence of recreational use on site: Yes___, No X, Describe:___

Accessibility - Fences, warning signs, closed roads? Locked gate 1/4
mile from site.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes ☐, No ☒, Comment _____
 Wilderness Area - Yes ☐, No ☒, Comment _____
 T&E Species Habitat - Yes ☒, No ☐, Comment Peregrine Falcon
 Bat Habitat - Yes ☒, No ☐, Comment Adits

Primary Drainage ; Secondary Drainage X ; No Information :

Riparian Habitat Quality - High___, MediumX, Low___
Wetlands Frontage - HighX, Medium___, Low___
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No , Number 4, types and locations:
Adits

Hazardous structures: Yes , No X , Number , types and locations:

Unstable highwalls, pits, trenches, slopes: Yes ____, No X, Number ____,
types and locations:

Unstable waste piles, impoundments, undercut banks: Yes , No X,
Number , types and locations:

Fire and/or Explosion hazards: Yes , No X , Explain:

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Ant, Prepared by Northern Engineering and Testing, September 20, 1988.

USGS, Topographic Map, Potato Lakes, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

ANT
PA NO. 20-194

Ant PA# 20-194
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 09/09/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-194-WR-1	1060	3420 J	0.6 U	2.13 U	4.85	50.6 J	67200	0.312	321 J	2.78 U	25.2	11.4 J	26.9	NR
BACKGROUND	11 J	267	1.7	11	8.7	7.8	12800	0.08 JX	250	9	15	5 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. ACID/BASE		SULFUR POTENT.		PYRITIC ACID/BASE		ORGANIC SULFUR		PYRITIC ACID/BASE		SULFUR POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
20-194-WR-1	0.63	19.7	3.94	-15.	0.01	0.07	0.55	2.19	1.75					

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO ₃ /L)
20-194-SW-1	3.5	2.01 U	2.57 U	9.7 U	6.88 U	3.1 J	1700	0.12 UJX	604	19.6 JX	2.83	30.7 U	13.7 J	639

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N	CYANIDE
20-194-SW-1	950	< 5.0	519	0.63	NR

LEGEND

WR1 - Composite of subsamples WR1A and 1B.
BACKGROUND - From Montana Prince (41-004-SS-1).
SW1 - Acid discharge at waste rock dump 1.

XRF ANALYSIS RESULTS

ANT

PA NO. 20-194

Ant PA# 20-194
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-194-WR1-A			14622.7	1851.17	215.843 *	1017.43 *	72769.1	489.49 *			685.126	101.713
20-194-WR1-B			4204.16	473.241 *		1166.59 *	258306				2294.69	35.3367 *
20-194-WR-1-COMP			6528.09	1252.56		1100.08 *	165031				1400.43	71.9721
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-194-WR1-A	189.001				94.36			3446.77	120.443 *			
20-194-WR1-B	140.222				85.3323			16575.3				
20-194-WR-1-COMP	146.551				82.529	260.178 *		10738.4	164.254 *			

* - Estimated Quantity
\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

ANT
PA NO. 20-194

AIMSS SCORESHEET

SITE NAME:

ANT

PA NUMBER:

20-194

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.089
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		38
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	40.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	8821
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.147
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		0
19		FISHERY		0
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	7
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	321
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.011
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	45
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	25
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	25
38		LIKELIHOOD SCORE	LINES 36 + 37C	25
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.011
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	0
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			0.09
	(LINES 10 + 24 + 35 + 44) / 100,000			

LINE NO.			SITE NAME:	ANT
			PA NUMBER:	20-194
	SITE SAFETY			
1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	200
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	200
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	0.00

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: COMBINATION MILLSITE PA#: 20-009

Date: July 21, 1993 Time: 0930-1630

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: Earl McCurley, MDSL
Steve Cutler, MDHES
Frank Maciosek, ASARCO

Weather/Seasonality Observations: Partly cloudy in the morning;
rain in the afternoon; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #7: SW-1 location
downstream Lower South Fork Willow Creek; #8: Junction Mill Creek
and South Fork Willow Creek; #9: SW-2 location upstream Mill Creek;
#10: SW-3 location upstream Lower South Fork Willow Creek; #11:
South end of tailings; #12: North end of tailings; #13: North end
of mill with unknown container; #14, #15: Millsite; #16: Inside
unknown container. Video Tape No. 4

General Comments/Observations (not covered specifically in attached Inventory Forms):
Tailings in floodplain are partially reclaimed; could be natural
or man-made.

Other Hazardous Materials/Substances Present: Vat containing
unknown materials and a pile of white powder at millsite.

General Comments on Potential Remedial Alternatives: Revegetate
and stabilize flood plain tailings; re-route Mill Creek to go
through less tailings and re-route Willow Creek around edge of
flood plain tailings.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): COMBINATION MILLSITE PA#: 20-009

Legal Description: T 8N; R 14W; Sec. 7, SE 1/4 E 1/2 1/4

County: GRANITE Mining District: COMBINATION

Latitude: N 46° 27' 30" Longitude: W 113° 23' 30"

Primary Drainage Basin and Code: Flint Creek/17010202

Secondary Drainage Basin: South Fork Lower Willow Creek

USGS Quadrangle map name(s): Black Pine Ridge

Mine Type/Commodities: Hardrock/Copper, Lead, Zinc, Silver, Gold

Activity Status: Active , Inactive/Exploration , Abandoned X.

Ownership status: Known YX N; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): ASARCO, Inc.,
180 Maiden Lane, New York, NY 10038; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: West of
Black Pine mine.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? Combination mine is part of Black
Pine MDSL hardrock permit; mill is not. Some reclamation and
revegetation done and planned by Inspiration Mining on tailings.

General site features: Elevation 5600', Slope Flat,
Aspect West

Land use: Mining X, Recreational , Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? 8.3 acres.
Dimensions: 1,800 feet x 200 feet

Predominant vegetation types: Fir, willows

Access: roads - good X, poor , 4wd , trail .
Other logistical considerations (proximity to other sites). Gate
is locked at Black Pine mine.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Mill Creek and Lower South Fork Willow Creek have confluence at millsite. Willow Creek flows 14 miles to Flint Creek drainage.

Mining/milling history, ore type/tenor, host rock, gangue: In 1887, a 10-stamp mill was built on the South Fork of Lower Willow Creek. The mill was in continuous operation until 1897, when it shut down, and re-opened in 1928.

Mine Operation?

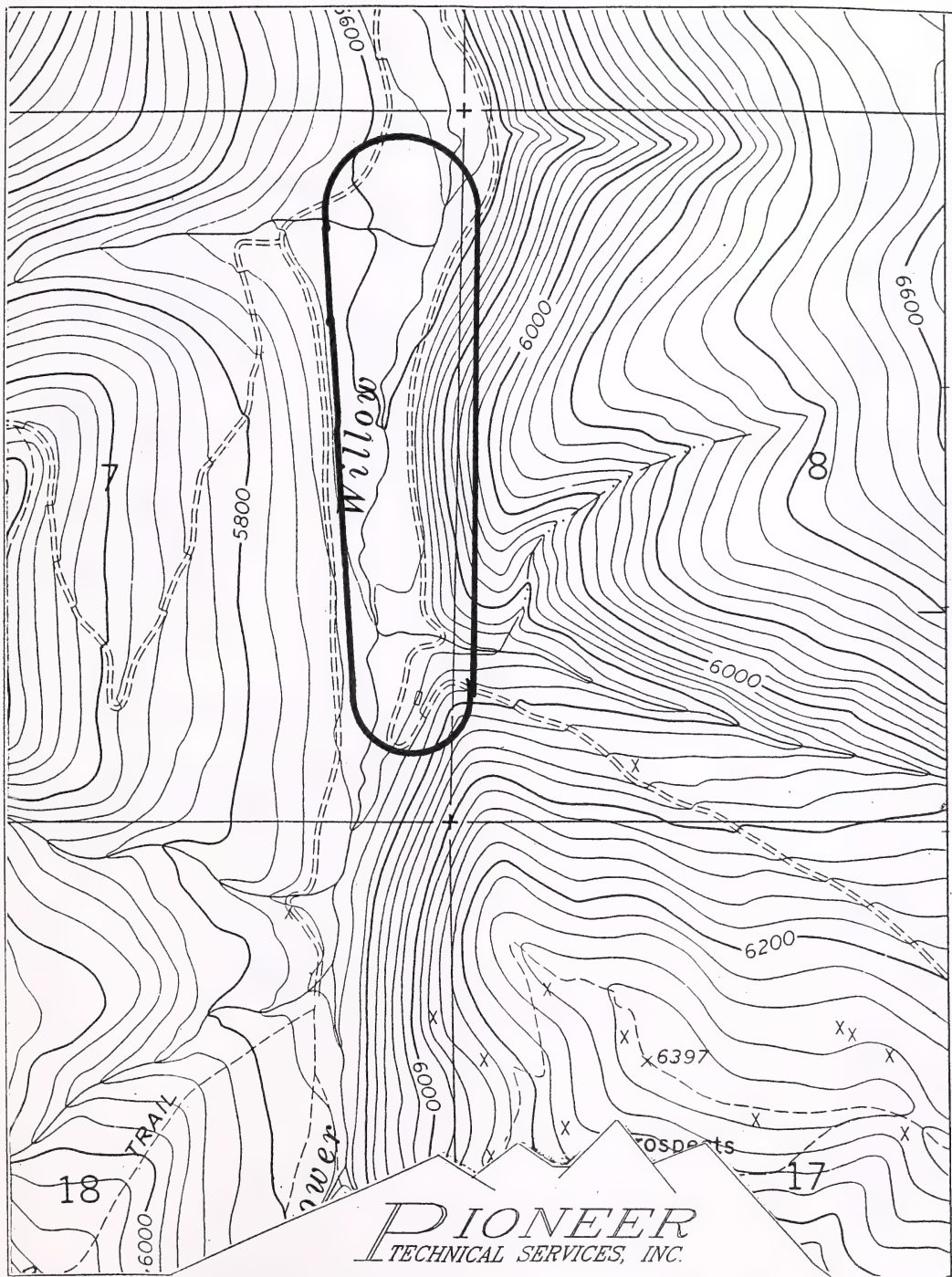
Shafts - Yes , No X, # , Comment
Adits - Yes , No X, # , Comment
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No _____. If yes answer the next three questions:

Period(s) of Operation: 1887 to 1897; 1928 to unknown

Origin of Ore Milled - Custom Mill___ Dedicated Mill_X ; Number and names of mines that supplied mill feed: Combination and possibly Black Pine

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
 Floatation



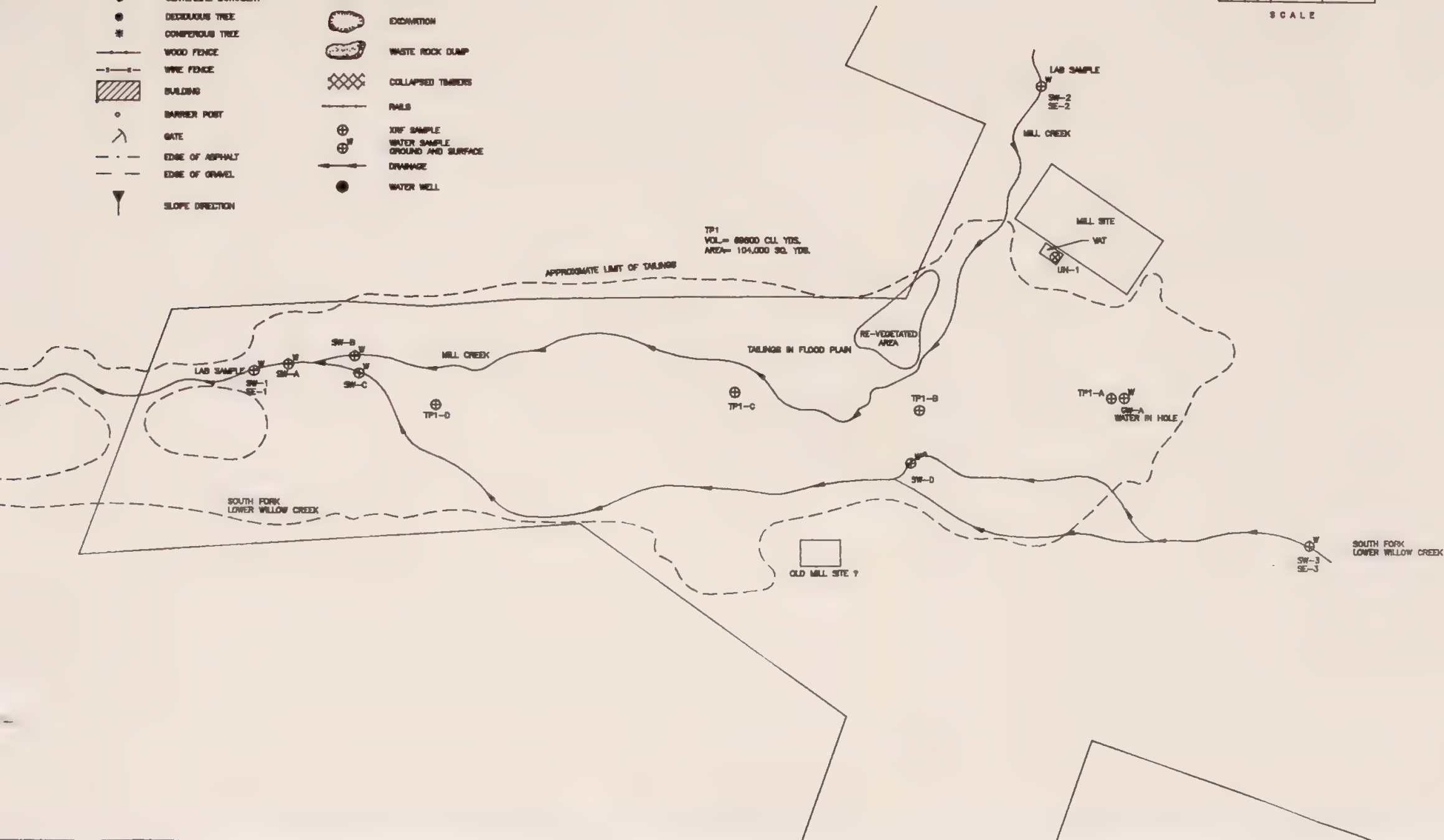
COMBINATION, P.A. NO. 20-009

T08N, R14W, SECTION 07

SCALE: 1" = 1000'

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
=====	CULVERT	—+—	OPEN ADIT
* / *	LIGHT (LIGHT POLE)	—+—	COLLAPSED ADIT
○	UTILITY POLE	⊠	OPEN SHAFT
●	CENTERLINE MONUMENT	⊠	COLLAPSED SHAFT
●	DECIDUOUS TREE	○	EXCAVATION
* / *	CONIFEROUS TREE	○	WASTE ROCK DUMP
—+—	WOOD FENCE	⊠	COLLAPSED TIMBERS
—+—	WIRE FENCE	—+—	RAILS
▨	BUILDING	⊕	XRF SAMPLE
○	BARRIER POST	⊕	WATER SAMPLE
—+—	GATE	⊕	GROUND AND SURFACE
—+—	EDGE OF ASPHALT	—+—	DRAINAGE
—+—	EDGE OF GRAVEL	●	WATER WELL
▲	SLOPE DIRECTION		

LEGEND



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

COMBINATION PA# 20-009
COMBINATION DISTRICT GRANITE COUNTY

DRAWN: JTP DATE: 8 OCT 83
DESIGNED: JTP JOB NO. 93-17
APPROVED: MJB F.B. NO.

PIONEER
ENGINEERING CONSULTANTS

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPOKANE
MONTANA
WASHINGTON

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Tailings mixed with flood plain sediments; (sand/silt and gravel). _____

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): No impoundment; could not determine depth because of mix with gravels, at least two feet deep in most places. _____

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry _____

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment, flood plain tailings _____

Comments on potential for mitigation: Re-route stream (Mill Creek); need to add nutrients to revegetate. _____

SOURCE INVENTORY FORM

SAMPLERS: Tuesday

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	DH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
TP-1A-1	TAIL	69,500	85' southwest of B600 stake; 0-12", orange tails with gravels	None	6.7 (D)	0.05	20-009-TP-1	07/21/93 1515	T-Metals, ABA
TP-1A-2	TAIL		85' southwest of B600 stake; 12-24", grey tails with gravel	None	5.3 (D)	0.05			
TP-1B-1	TAIL		45' south southeast of B800 stake; 0-12", tan sand	None	5.2 (D)	0.03			
TP-1B-2	TAIL		45' south southeast of B800 stake; 12-24", yellow silt/sand tails	None	< 3.5 (D)	0.045			
TP-1B-3	TAIL		45' south southeast of B800 stake; 24-30", black/brown swamp clay	None	3.9 (D)	0.02			
TP-1C-1	TAIL		B1200 stake; 0-6", brown sand/loam	None	5.6 (D)	0.03			
TP-1C-2	TAIL		B1200 stake; 6-12", yellow sand/silt	None	6.2 (D)	0.04			
TP-1C-3	TAIL		B1200 stake; 12-18", tan sand/gravel	None	6.1 (D)	0.03			
TP-1D-1	TAIL		B1600 stake; 0-6", brown sand	None	5.8 (D)	0.02			
TP-1D-2	TAIL		B1600 stake; 6-12", dark brown loam	None	3.6 (D)	0.04			
TP-1D-3	TAIL		B1600 stake; 12-24", yellow/brown clays with gravels	None	5.3 (D)	0.03			
UN-1	VAT	15	Steel tank at millsite	Poor					
SS-1	BKGRND	N/A	Background soil	N/A	N/A	N/A	20-009-SS-1	07/21/93 1500	T-Metals

*D-Direct reading(Kelvey Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-009-TP-1 is composite of TP-1A-1, TP-1B-2, TP-1C-1, and TP-1D-1.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes ☐, No ☒, Number: Identification:

Filled shafts: Yes ☐, No ☒, Number: Identification:

Seeps/Springs: Yes ☐, No ☒, Number: Identification:

Groundwater wells within 4 miles?: Yes ☒, No ☐;
Number of well logs: 1

Distance to nearest well used for drinking? Unknown; possibly at mine site, if not, great distance to nearest residence.

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite ☐, Probable ☐, Possible ☒, Unlikely ☐.

pH of water in tailings test hole was 6.9.

Other observations/notes: N/A

SAMPLERS: Belanger

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): South Fork Lower Willow Creek; Mill Creek

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): TP-1

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 12.3 cfs
High Flow: 125 cfs, Average Flow: 15 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No ,
Describe: Both Mill Creek and South Fork Lower Willow Creek flow through the tailings.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetland, agriculture, fishery

Observed erosional/sedimentation/stream turbidity problems? Yes X, No , Distance downstream (ft)? 2650+ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Tailings observed downstream in banks for at least 1/2 mile.

SURFACE WATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu\text{S}/\text{cm}$ @ 25°C	Kh mV	Temp °C	ALK. mg/L as CaCO ₃	Flow' cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream from junction of Mill and Willow Creeks	7.31	70	151.2	10.1	8.0	12.3 cfs (M)	20-009-SW-1	07/21/93 1100	T-Metals, TDS, Hardness, Cl ⁻ , SO ₄ , NO ₂ /NO ₃
SE-1	SE	Downstream from junction of Mill and Willow Creeks	N/A	N/A	N/A	N/A	N/A	N/A	20-009-SE-1	07/21/93 1100	T-Metals
SW-2	SW	Upstream in Mill Creek	7.32	80	113.4	7.9	15.0	0.35 cfs (M)	20-009-SW-2	07/21/93 1230	T-Metals, TDS, Hardness, Cl ⁻ , SO ₄ , NO ₂ /NO ₃
SE-2	SE	Upstream in Mill Creek	N/A	N/A	N/A	N/A	N/A	N/A	20-009-SE-2	07/21/93 1230	T-Metals
SW-3	SW	Upstream in South Fork Lower Willow Creek	7.64	60	109.3	9.7	5.5	NM	20-009-SW-3	07/21/93 1300	T-Metals, TDS, Hardness, Cl ⁻ , SO ₄ , NO ₂ /NO ₃
SE-3	SE	Upstream in South Fork Lower Willow Creek	N/A	N/A	N/A	N/A	N/A	N/A	20-009-SE-3	07/21/93 1300	T-Metals
SW-A	SW	Test at junction of Mill and Willow Creeks	7.53	70	154.9	10.4	NM	NM	N/A	N/A	Field Parameters
SW-B	SW	Mill Creek at junction	7.51	90	159.3	13.1	NM	NM	N/A	N/A	Field Parameters
SW-C	SW	Lower South Fork Willow Creek at junction	7.35	60	151.6	9.6	NM	NM	N/A	N/A	Field Parameters
SW-D	SW	Branch of South Fork Willow Creek flowing over tails	7.81	70	197.0	9.6	NM	NM	N/A	N/A	Field Parameters
SP-500	SE	500 feet downstream of main tails	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SP-1000	SE	1,000 feet downstream of main tails	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 to 6 acres

Wetlands present: Yes X, No , Describe: Several acres downstream from tailings in Willow Creek floodplain.

Carbonate rocks/soils: Yes , No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X; 10-30 ; 30-100 ; 100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ; Comments

Nearest residence(ft or miles)? 2 miles north of site

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

Montana Bureau of Mines and Geology
Water Well Log Data

11/05/1993

Well No.	Location	Depth	Yield	Static Water Level
57488	08N 14W 07 DDD	60.0	60.0	20.00

SAMPLERS: Tuesday

[illegible]

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe:_____

Population within 1 mile: 1-10____; 10-30____; 30-100____; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments None; mine workers at Black Pine mine.

Evidence of recreational use on site: Yes____, No X, Describe:_____

Accessibility - Fences, warning signs, closed roads? Fenced and gated

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Bald Eagle</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage X; Secondary Drainage____; No Information____:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium <u>X</u> , Low____
Fisheries Habitat and Species Classification -	<u>4</u>
Sport Fishery Classification -	<u>3</u>

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes____, No X, Number____, types and locations:_____

Hazardous structures: Yes____, No X, Number____, types and locations:_____

Unstable highwalls, pits, trenches, slopes: Yes____, No X, Number____, types and locations:_____

Unstable waste piles, impoundments, undercut banks: Yes____, No X, Number____, types and locations:_____

Fire and/or Explosion hazards: Yes____, No X, Explain:_____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/WQB, Analytical Data for Combination Millsite, June 2, 1977, July 13 and 20, 1978, and August 18, 1978.

MDSL/AMRB Files, Letter to Ed Gensler, MDSL, From Bob Wintergerst, Deerlodge National Forest, Regarding Material for the Combination Mining/Milling Site in Granite County, September 14, 1987.

Schafer and Associates, Final Report for the Combination Millsite Stabilization Project Black Pine Mining District, Montana, April 8, 1992.

USDA, Water Analysis for the Combination Milling Site, Written by Bob Wintergerst, Date Unknown.

USGS, Topographic Map, Black Pine Ridge, Montana, 7 1/2 minute Quadrangle, 1971.

(1)

(2)

(3)

LABORATORY ANALYTICAL DATA

COMBINATION MILLSITE
PA NO. 20-009

Combination PA# 20-009
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/21/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-009-SE-1	311	105	6.9	6.01	1.74	830	10800	52.3 J	372 J	2.8 U	1550	337	241	NR
20-009-SE-2	37.1	286	2.4	6.5	10.2	250	13400	1.07 J	605 J	13.7	27.4	27.4	80.1	NR
20-009-SE-3	10.2	94.9	0.9	2.93	2.45	18.8	3710	0.082 J	206 J	2.49 U	21	6.07	32.6	NR
20-009-TP-1	2050	1100	89.5	3.33	4.51	9620	28300	306 J	462 J	3.29	14400	2210	584	NR
BACKGROUND	76.3	329	1.6	6.18	6.06	116	11700	1.33 J	1530 J	6.77	85.8	33.3	47.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID/BASE v/100x	NEUTRAL POTENT. v/100x	SULFUR ACID/BASE POTENT. v/100x	PYRITIC SULFUR %	ORGANIC SULFUR %	Fe	Pyritic Acid Base v/100x	Sulfur Acid Base POTENT. v/100x
20-009-TP-1	0.08	2.5	1.81	-0.6	<0.01	0.02	0	0	1.81

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-009-SW-1	3.25	78.5	2.57 U	9.7 U	6.83 U	21.9	410	0.081	20.9	12.7 U	9.93	30.7 U	7.57 U	15.1
20-009-SW-2	2.4	69.7	2.57 U	9.7 U	6.83 U	17.2	1280	0.038 U	17.4	12.7 U	3.3	30.7 U	7.57 U	21
20-009-SW-3	1.69 U	78.2	2.57 U	9.7 U	6.83 U	1.9	264	0.038 U	15.6	12.7 U	1.55 U	30.7 U	7.57 U	14.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-009-SW-1	89	< 5.0	7	0.16	NR
20-009-SW-2	112	< 5.0	14	< 0.05	NR
20-009-SW-3	95	< 5.0	6	0.18	NR

LEGEND

SE1 - Downstream from junction of Mill Creek and Willow Creek.
SE2 - Upstream in Mill Creek.
SE3 - Upstream in S. Fork Lower Willow Creek.
TP1 - Composite of subsamples TP1A1, 1B2, 1C1, and 1D1.
BACKGROUND - From the Combination Mine (20-009-SS-1).

SW1 - Same as sample SE1.
SW2 - Same as sample SE2.
SW3 - Same as sample SE3.

XRF ANALYSIS RESULTS

**COMBINATION MILLSITE
PA NO. 20-009**

Mine Name: Combination PA# 20-009
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-009-SE-1000		11635.7	3456.64	1158.59		529.54 *	14452.2		775.004	177.787	104.456 *	31.2294
20-009-SE-500		9209.56	3188.95	884.002		551.009 *	13411.9		921.711	76.1533 *	81.91 *	46.0379
20-009-SS-1		16074.8	7473.25	2139.15		1723.44	14610.4		161.404 *	85.165 *	63.4888 *	130.598
20-009-TP1A-1		5550.7	6975.39	381.827 *		703.024 *	25660.3	302.165 *	8771.19	544.343	957.145	48.1342
20-009-TP1A-2		18218.9	9114.38	2538.46		336.392 *	14242.1		387.317	180.278		202.648
20-009-TP1A-2		18218.9	9114.38	2538.46		336.392 *	14242.1		387.317	180.278		202.648
20-009-TP1B-1		6392.98	1888.87	264.324 *		704.478 *	12077.5		1159.16	102.728 *	179.155 *	18.2241
20-009-TP1B-2		7420.07	451.355 *			34376.4			10142.1	550.289	1401.95	30.4373 *
20-009-TP1B-3		14352.4	4470.98	2060.64		703.99 *	18479.6		1843.45	114.627 *	214.199	109.013
20-009-TP1C-1		9152.54	3991.22	720.011	166.593 *	364.238 *	23591.2		3970.53	194.032	459.838 *	34.674
20-009-TP1C-2		19845.6	2132.37	1048.35		333.271 *	10619.8		1250.1	194.032		32.674
20-009-TP1C-3		11577.4	2560.78	438.608		958.469	17697.2		1347.64	454.992	197.867 *	9.93077 *
20-009-TP1D-1		10771.3	4663.64	1100.3		1382.71	33140.7		6890.51	488.252	723.769	74.2076
20-009-TP1D-2		14208.7	4601.77	2048.83		570.191 *	19429.3		1002.86	286.059	63.6555 *	103.402
20-009-TP1D-3		2141.2	3665.23	2155.07		552.792 *	17001.2		632.275	198.44		68.4823 *
20-009-TP-1-COMP	352.228 *	10979.9	8214.39	982.868		580.521 *	32146.8	360.484 *	8020.72	656.529	1129.2	32.3625 *
20-009-UNK1		6006.58	9907.75	1093.99		2629.19	70670.4		9413.32	3596.41	14258.5	105.991
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-009-SE-1000	112.138	104.775 *	4.00434 *	1163.16	65.0704		1833.85	333.463			18.2302	
20-009-SE-500	136.098	7.8147 *		1034.45	59.6317		1351.68	358.003	93.6039 *		26.8605	
20-009-SS-1	250.163			81.8425	109.711		92.5134 *	562.88	91.2009 *		16.0421	
20-009-TP1A-1	35.3559	427.96	18.5918 *	14597.8	87.631	213.096 *	11476.5	1178.56	623.298		73.4977 *	
20-009-TP1A-2	245.498			716.505	137.088		742.448	642.077			24.3316 *	
20-009-TP1A-2	245.498			716.505	137.088		742.448	642.077			24.3316 *	
20-009-TP1B-1	86.4338	97.5714 *	6.65124 *	2107.28	37.5924		2417	318.438	156.089 *		26.2596 *	
20-009-TP1B-2	13.2013 *	539.628	20.6216	14816.7	102.164	265.115 *	13277.2	1130.69	810.839		99.3349	
20-009-TP1B-3	191.615			275.395	106.657		173.293 *	560.907			25.5294	
20-009-TP1C-1	123.627	484.78		4355.96	88.1936		4201.28	540.919	165.395 *		51.0365	
20-009-TP1C-2	219.778	115.141		219.778	101.535		896.785	540.919			16.0208	
20-009-TP1C-3	81.4376	261.529		3448.68	74.9036		2814.68	514.746	103.767 *		26.3492	
20-009-TP1D-1	138.277	462.769	11.3564 *	4581.37	114.219		4183.86	789.23	108.969 *		47.4396	
20-009-TP1D-2	279.082		9.19096 *	240.184	110.617		135.398 *	595.713			18.9313	
20-009-TP1D-3	349.17		5.28557 *	48.0697 *	115.847		62.2152 *	500.446			11.3682	
20-009-TP-1-COMP	63.5862	590.359	6.61174 *	12841.7	117.402	406.533 *	12217	1299.3	558.239		72.5277	
20-009-UNK1	101.922	102.71 *	10.5471 *	2332.84	153.416	410.389 *	6516.68	221.193	394.663 *		102.732	

* - Estimated Quantity
\$ - Unvalidated Data



**SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES**

STATE HEALTH DEPT.

WATER QUALITY BUREAU

HELENA, MONTANA 59601

STATE MONTANA

COUNTY GRANITE

LAT.-LONG. 461918N 1131725W

SAMPLE LOCATION 7N 14W 36ABD

STATION CODE

ANALYSIS NUMBER 77W1055

DATE SAMPLED 05-02-77

DRAINAGE BASIN 2665

TIME SAMPLED 1330

WATER FLOW RATE .75CFS(M)

METHOD SAMPLED GRAB

FLOW MEASUREMENT METHOD GURLEY METER

SAMPLE SOURCE STREAM

ALTITUDE OF LAND SURFACE

WATER USE UNKNOWN

TOTAL WELL DEPTH BELOW LS

AQUIFER(S)

SWL ABOVE(+) OR BELOW LS

SAMPLED BY AQBH

SAMPLE DEPTH BELOW SURFACE

SAMPLING SITE: DOUGLAS CREEK BELOW TAILINGS

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	89.	1.853
IRON (FE)	<.05		FLUORIDE (F)		
MANGANESE (MN)	6.6	0.240	PHOSPHATE (PO4 AS P)		
ALUMINUM (AL)			NO3+NO2 (TOT AS N)		

SUM CATIONS	6.600	0.240	SUM ANIONS	39.000	1.853
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LABORATORY PH	7.50	TOT HARDNESS (MG/L-CACCB)	
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY (MG/L-CACCB)	
M-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (JTU)	66.
LAB CONDUCTIVITY-JMHDS-25C	417.6	SODIUM ADSORPTION RATIO	

A D D I T I O N A L P A R A M E T E R S			
SEDIMENT, TOT, SUSP (MG/L)	83.	ARSENIC, DISS (MG/L AS AS)	.070
CADMIUM, DISS (MG/L AS CD)	<.005	COPPER, DISS (MG/L AS CU)	.02
LEAD, DISS (MG/L AS PB)	<.05	ZINC, DISS (MG/L AS ZN)	.82
ZINC, TR (MG/L AS ZN)	1.3	COPPER, TR (MG/L AS CU)	.04
MANGANESE, TR (MG/L AS MN)	7.2	CADMIUM, TR (MG/L AS CD)	< 0.005
IRON, TR (MG/L AS FE)	2.5	LEAD, TR (MG/L AS PB)	.12
ARSENIC, TR (MG/L AS AS)	1.8	MERCURY, TR (MG/L AS Hg)	< 0.0002
MERCURY, DISS (MG/L AS Hg)	< 0.0002		

REMARKS: PHILIPSBERG 0662

WATER TURBID

HG EXCEEDED HOLDING TIME

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)=MEASURABLE (P)=REPORTED (E)=ESTIMATED METERS TR=TOTAL RECOVERABLE

SAMPLE NO 01	SAMPLER	DP	HANDLING 3210	ANALYST KEV	LAB	WQB.
COMPLETED 10-04-77 COMPUTER RUN 10/13/77 DATA 0975/PROG 0876 FUND 0662						
STND DEV.	ION BALANCE	9.99	CA	MG	NA	K
SEGMENT	IPDES	0.0	0.0	0.0	0.0	0.0100.0
CALC. MEQ/L=INSUFFICIENT DATA						77W1055

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	4633 IN 1131254W	SAMPLE LOCATION	9N 13W 10ACC
STATION CODE		ANALYSIS NUMBER	78W1294
DATE SAMPLED	07-13-78	DRAINAGE BASIN	766J
TIME SAMPLED	1030	WATER FLOW RATE	5.6 CFS(M)
METHOD SAMPLED	GNAB	FLOW MEASUREMENT METHOD	GURLEY METER
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: DOUGLAS CREEK AT MOUTH

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	14.6	0.304
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	14.6	0.304
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LABORATORY PH	8.18	TOT HARDNESS(MG/L-CAC03)	
FIELD WATER TEMPERATURE (C)	11.0	TOT ALKALINITY(MG/L-CAC03)	
SUM-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-UMHOS-25C	286.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L P A R A M E T E R S			
SEDIMENT, TOT, SUSP (MG/L)	9.1	ARSENIC, TR (MG/L AS AS)	.003
CADMIUM, TR (MG/L AS CD)	< .001	COPPER, TR (MG/L AS CU)	< .01
LEAD, TR (MG/L AS PB)	< .005	ZINC, TR (MG/L AS ZN)	< .005
PHOSPHOROUS, TOT (MG/L-P)	.057	MERCURY, TR (MG/L AS HG)	< .0002
SILVER, TR (MG/L AS AG)	< .005	IRON, TR (MG/L AS FE)	.15
MANGANESE, TR (MG/L AS MN)	.025		

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)=MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 14	SAMPLER GL1	HANDLING 5301	ANALYST JH	LAB WQBH
COMPLETED 11-13-78	COMPUTER RUN 11/27/78	DATA 0975/PROG 0876 FUND 6053		
STD DEV. ION BALANCE 3.29	CA	MG	NA	K CL SO4 HCO3 CO3 NO3
SEGMENT MPDES	0.0	0.0	0.0	0.0 0.0100.0 0.0 0.0 0.0
CALC. MEQ/L= INSUFFICIENT DATA				78W1294

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	4629 8N 113 9 5W	SAMPLE LOCATION	9N 12W 3100C
STATION CODE		ANALYSIS NUMBER	78W1297
DATE SAMPLED	07-13-78	DRAINAGE BASIN	706J
TIME SAMPLED	1300	WATER FLOW RATE	10.5 CFS(M)
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	GURLEY METER
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELCH LS	
AQUIFER(S)		SHL ABOVE(+) OR BELCH LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELCH SURFACE	

SAMPLING SITE: DOUGLAS CREEK JUST BELCH SEEP FROM ADIT

CAIUM (CA)	MG/L	MEQ/L	BICARBONATE (HCO3)	MG/L	MEQ/L
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	7.3	0.152
			FLUORIDE (F)		
			PHOSPHATE (PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	3.0	3.3	SUM ANIONS	7.3	0.152
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LABORATORY PH	8.62	TOT HARDNESS (MG/L-CAC03)	
FIELD WATER TEMPERATURE (C)	9.0	TOT ALKALINITY (MG/L-CAC03)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-UMHUS-25C	210.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L P A R A M E T E R S			
SEDIMENT, TOT, SUSP (MG/L)	3.7	ARSENIC, TR (MG/L AS AS)	.001
CADMIUM, TR (MG/L AS CD)	< .001	COPPER, TR (MG/L AS CU)	< .01
LEAD, TR (MG/L AS PB)	< .005	ZINC, TR (MG/L AS ZN)	.015
PHOSPHOROUS, TOT (MG/L-P)	.026	MERCURY, TR (MG/L AS HG)	< .0002
SILVER, TR (MG/L AS AG)	.005	IRON, TR (MG/L AS FE)	.03
MANGANESE, TR (MG/L AS MN)	.005		

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS IR=TOTAL RECOVERABLE

SAMPLE NO 17	SAMPLER GLI	HANDLING 5301	ANALYST JH	LAB WQBH
COMPLETED 11-13-78	COMPUTER RUN	11/27/78	DATA 0975/FRUG 0876	FUND 6053
STND DEV. ION BALANCE	1.67	CA	MG	NA K CL SO4 HCO3 CO3 NO3
SEGMENT	MPDES	0.0	0.0	0.0 0.0 0.0100.0 0.0 0.0 0.0
CALC. MEQ/L=	INSUFFICIENT DATA			78W1297

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	462915N 113 856W	SAMPLE LOCATION	9N 12W 31DCA
STATION CODE		ANALYSIS NUMBER	78W1295
DATE SAMPLED	07-13-78	DRAINAGE BASIN	766J
TIME SAMPLED	1145	WATER FLOW RATE	1.5 CFS(M)
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	GURLEY METER
SAMPLE SOURCE	MINE DRAIN	ALTITUDE OF LAND SURFACE	
WATER USE	UNUSED	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: SEEP FROM ADIT TO UPPER DOUGLAS CREEK

ALCIUM (CA)	MG/L	MEQ/L	BICARBONATE (HCO3)	MG/L	MEQ/L
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	11.2	0.233
			FLUORIDE (F)		
			PHOSPHATE (PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	11.2	0.233
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LABORATORY PH	8.07	TOT HARDNESS (MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)	9.2	TOT ALKALINITY (MG/L-CACO3)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-OMHOS-25C	225.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L

P A R A M E T E R S

ARSENIC, TR (MG/L AS AS)	< .003	CADMIUM, TR (MG/L AS CD)	< .001
COPPER, TR (MG/L AS CU)	< .01	LEAD, TR (MG/L AS PB)	< .005
ZINC, TR (MG/L AS ZN)	< .005	PHOSPHOROUS, TOT (MG/L-P)	.017
MERCURY, TR (MG/L AS HG)	< .0002	SILVER, TR (MG/L AS AG)	< .005
IRON, TR (MG/L AS FE)	< .01	MANGANESE, TR (MG/L AS MN)	< .005

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLEQUIVILENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO UK	SAMPLER GLI	HANDLING 4301	ANALYST JH	LAB WQBH
COMPLETED 11-15-78	COMPUTER RUN 11/27/78	DATA C975/PROG 0876 FUND 6053		
STND DEV. ION BALANCE 2.54	CA	MG	NA	K
SEGMENT MPDES	0.0	0.0	0.0	0.0
CALC. MEQ/L= INSUFFICIENT DATA				

78W1295

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	462928N 113 837W	SAMPLE LOCATION	9N 12W 31DAA
STATION CODE		ANALYSIS NUMBER	78W1296
DATE SAMPLED	07-13-78	DRAINAGE BASIN	766J
TIME SAMPLED	1230	WATER FLOW RATE	9.0 CFS(M)
METHOD SAMPLED	GRA3	FLOW MEASUREMENT METHOD	GURLEY METER
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WGBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: DOUGLAS CR JUST BLW CONFL NC.AND MID FKS

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	6.7	0.139
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	9.0	0.0	SUM ANIONS	6.7	0.140
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LABORATORY PH	8.81	TOT HARDNESS(MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)	8.5	TOT ALKALINITY(MG/L-CACO3)	
SUM-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-JMHOS-25C	208.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L		P A R A M E T E R S	
SEDIMENT, TOT, SUSP (MG/L)	3.6	ARSENIC, TR (MG/L AS AS)	.001
CADMIUM, TR (MG/L AS CD)	< .001	COPPER, TR (MG/L AS CU)	< .01
LEAD, TR (MG/L AS PB)	< .005	ZINC, TR (MG/L AS ZN)	.018
PHOSPHOROUS, TOT (MG/L-P)	.027	MERCURY, TR (MG/L AS HG)	< .0002
SILVER, TR (MG/L AS AG)	< .005	IRON, TR (MG/L AS FE)	.02
MANGANESE, TR (MG/L AS MN)	.005		

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)=MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 16	SAMPLER GLI	HANDLING 5301	ANALYST JH	LAB WGBH
COMPLETED 11-15-78	COMPUTER RUN 11/27/78	DATA 0975/PROG 0876	FUND 6053	
STND DEV. ION BALANCE 1.53	CA	MG	NA	K
SEGMENT MPDES	0.0	0.0	0.0	0.0
CALC. MEQ/L=INSUFFICIENT DATA				

78W1296

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	462928N 113 818W	SAMPLE LOCATION	9N 12W 32CBA
STATION CODE		ANALYSIS NUMBER	78W1421
DATE SAMPLED	07-20-78	DRAINAGE BASIN	766J
TIME SAMPLED		WATER FLOW RATE	9. CFS(M)
METHOD SAMPLED		FLOW MEASUREMENT METHOD	GURLEY METER
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE		TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: MIDDLE FORK DOUGLAS CR AT MOUTH

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	4.8	0.100
			FLUORIDE (F)		
			PHOSPHATE (PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	4.8	0.100
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LABORATORY PH	8.51	TOT HARDNESS (MG/L-CAC03)	
FIELD WATER TEMPERATURE (C)	6.0	TOT ALKALINITY (MG/L-CAC03)	
SUM DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-OMHOS-25C	192.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L P A R A M E T E R S			
SEDIMENT, TOT, SUSP (MG/L) <	2.5	ARSENIC, TR (MG/L AS AS)	.001
CADMIUM, TR (MG/L AS CD)	< .001	COPPER, TR (MG/L AS CU)	< .01
LEAD, TR (MG/L AS PB)	< .005	ZINC, TR (MG/L AS ZN)	< .005
PHOSPHOROUS, TOT (MG/L-P)	.023	MERCURY, TR (MG/L AS HG)	< .0002
SILVER, TR (MG/L AS AG)	< .005	IRON, TR (MG/L AS FE)	< .01
MANGANESE, TR (MG/L AS MN)	< .005		

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO	SAMPLER	PCG	HANDLING	ANALYST	JH	LAB	WQBH
COMPLETED 11-15-78	COMPUTER RUN 11/27/78	DATA 0975/PRG 0876	FUND 6053				
STND DEV. ION BALANCE 1.10	CA	MG	NA	K	CL	SO4	HCO3
SEQUENT MPDES	0.0	0.0	0.0	0.0	0.0100	0.0	0.0
CA . . . MEQ/L= INSUFFICIENT DATA							

78W1421

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	4631 9N 113 514W	SAMPLE LOCATION	9N 12W 220B
STATION CODE		ANALYSIS NUMBER	78W1426
DATE SAMPLED	07-20-78	DRAINAGE BASIN	766
TIME SAMPLED		WATER FLOW RATE	50. GPM(M)
METHOD SAMPLED		FLOW MEASUREMENT METHOD	BUCKET+ TIME
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE		TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WGBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: DUNKELBERG BELOW FOREST ROSE MINE

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	174.0	3.623
			FLUORIDE (F)		
			PHOSPHATE (PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	174.0	3.623
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LABORATORY PH	8.06	TOT HARDNESS (MG/L-CACCO3)	
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY (MG/L-CACCO3)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-UMHUS-25C	605.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L P A R A M E T E R S			
SEDIMENT, TOT, SUSP (MG/L) <	4.2	ARSENIC, TR (MG/L AS AS)	< .001
CADMIUM, TR (MG/L AS CD)	< .001	COPPER, TR (MG/L AS CU)	< .01
LEAD, TR (MG/L AS PB)	< .005	ZINC, TR (MG/L AS ZN)	.028
PHOSPHOROUS, TOT (MG/L-P)	.019	MERCURY, TR (MG/L AS HG)	.0013
SILVER, TR (MG/L AS AG)	< .005	IRON, TR (MG/L AS FE)	.07
MANGANESE, TR (MG/L AS MN)	.025		

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO	SAMPLER	PCG	HANDLING	ANALYST	JH	LAB	WGBH
COMPLETED 11-15-78	COMPUTER RUN	11/27/78	DATA C975/PROG C876 FUND 6053				
STND DEV. ION BALANCE	9.99	CA	MG	NA	K	CL	SO4
SEGMENT	MPDES	0.0	0.0	0.0	0.0	0.0100.0	0.0
CALC. MEQ/L= INSUFFICIENT DATA							78W1426

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	4630 4N 113 533W	SAMPLE LOCATION	9N 12W 27CD
STATION CODE		ANALYSIS NUMBER	78W1428
DATE SAMPLED	07-20-78	DRAINAGE BASIN	706J
TIME SAMPLED		WATER FLOW RATE	
METHOD SAMPLED		FLOW MEASUREMENT METHOD	NOT MEASURED
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE		TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: NORTH FORK DOUGLAS CR. BELOW MINE

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	123.0	2.561
			FLUORIDE (F)		
			PHOSPHATE (PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	123.0	2.561
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LABORATORY PH	8.46	TOT HARDNESS (MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)	9.0	TOT ALKALINITY (MG/L-CACO3)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-UMHDS-25C	319.0	SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS			
SILTMENT, TOT, SUSP (MG/L) <	4.3	ARSENIC, TR (MG/L AS AS)	.001
CADMIUM, TR (MG/L AS CD)	.004	COPPER, TR (MG/L AS CU)	< .01
LEAD, TR (MG/L AS PB)	< .005	ZINC, TR (MG/L AS ZN)	1.3
PHOSPHOROUS, TOT (MG/L-P)	.013	MERCURY, TR (MG/L AS HG)	< .0002
SILVER, TR (MG/L AS AG)	< .005	IRON, TR (MG/L AS FE)	.02
MANGANESE, TR (MG/L AS MN)	.030		

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (R)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO	SAMPLER	PCG	HANDLING	ANALYST	JH	LAB	WQBH
COMPLETED 11-15-78	COMPUTER RUN	11/27/78	DATA	C975/PROG	G876	FUND	6053
STND DEV. ION BALANCE	9.99	CA	MG	NA	K	CL	SO4
SEGMENT	MPDES	0.0	0.0	0.0	0.0	0.0100	0.0
CALC. MEQ/L=	INSUFFICIENT DATA						

78W1428

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	462928N 113 827W	SAMPLE LOCATION	9N 12W 32CB6
STATION CODE		ANALYSIS NUMBER	78W1420
DATE SAMPLED	07-20-78	DRAINAGE BASIN	766J
TIME SAMPLED		WATER FLOW RATE	.00CFS(M)
METHOD SAMPLED		FLOW MEASUREMENT METHOD	GURLEY METER
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE		TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SKL ABOVE(+) OR BELOW LS	
SAMPLED BY	WGBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: NORTH FORK DOUGLAS CREEK AT MOUTH

	MG/L	MEQ/L		MG/L	MEQ/L
ALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SC4)	20.5	0.427
			FLUORIDE (F)		
			PHOSPHATE (PC4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	20.5	0.427
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LABORATORY PH	8.56	TOT HARDNESS (MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)	10.0	TOT ALKALINITY (MG/L-CACO3)	
SUM DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (NTU)	
LAS CONDUCTIVITY-UMHOS-25C	237.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L		P A R A M E T E R S	
SEDIMENT, TOT, SUSP (MG/L)	6.0	ARSENIC, TR (MG/L AS AS)	.001
CADMIUM, TR (MG/L AS CO)	.002	COPPER, TR (MG/L AS CU)	< .01
LEAD, TR (MG/L AS PB)	< .005	ZINC, TR (MG/L AS ZN)	.11
PHOSPHOROUS, TOT (MG/L-P)	.024	MERCURY, TR (MG/L AS HG)	< .0002
SILVER, TR (MG/L AS AG)	< .005	IRON, TR (MG/L AS FE)	.08
MANGANESE, TR (MG/L AS MN)	.015		

REMARKS: FLINT CREEK STUDY

INSECTS ABUNDANT

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO	SAMPLER	PCG	HANDLING	ANALYST	JH	LAB	WGBH
COMPLETED 11-15-78	COMPUTER RUN	11/27/78	DATA 0975/PROG 0876	FUND 6053			
STND DEV. ION BALANCE	4.57	CA	MG	NA	K	CL	SC4
SEGMENT	MPDES	0.0	0.0	0.0	0.0	0.0100.0	0.0
CALC. MEQ/L=INSUFFICIENT DATA							0.0

78W1420

STATE HEALTH DEPT.

WATER QUALITY BUREAU

HELENA, MONTANA 59601

STATE MONTANA

COUNTY GRANITE

LAT.-LONG. 462954N 113 537W

SAMPLE LOCATION SN 12K 346AB

STATION CODE

ANALYSIS NUMBER 78W1900

DATE SAMPLED 08-18-78

DRAINAGE BASIN 7663

TIME SAMPLED 1500

WATER FLOW RATE 25. GPM(E)

METHOD SAMPLED GRAB

FLOW MEASUREMENT METHOD NOT MEASURED

SAMPLE SOURCE STREAM

ALTITUDE OF LAND SURFACE

WATER USE MULTIPLE

TOTAL WELL DEPTH BELOW LS

AQUIFER(S)

SHL ABOVE(+) OR BELOW LS

SAMPLED BY WQBH

SAMPLE DEPTH BELOW SURFACE

SAMPLING SITE: NORTH FORK DOUGLAS CREEK BELOW TAILINGS

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			DICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	115.0	2.394
			FLUORIDE (F)		
			PHOSPHATE (PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS

0.0

0.0

SUM ANIONS

115.0

2.394

LABORATORY PH 8.02
 FIELD WATER TEMPERATURE (C) 9.0
 SUM-DISS. IONS MEAS. (MG/L)
 AB CONDUCTIVITY-UMHUS-25C 407.3

TOT HARDNESS (MG/L-CACO3)
 TOT ALKALINITY (MG/L-CACO3)
 LABORATORY TURBIDITY (NTU)
 SODIUM ADSORPTION RATIO

ADDITIONAL PARAMETERS

SEDIMENT, TOT, SUSP (MG/L)	13.6	ARSENIC, TR (MG/L AS AS)	.003
CADMIUM, TR (MG/L AS CD)	.041	COPPER, TR (MG/L AS CU)	.04
LEAD, TR (MG/L AS PB)	< .005	ZINC, TR (MG/L AS ZN)	3.2
PHOSPHORUS, TOT (MG/L-P)	.003	MERCURY, TR (MG/L AS HG)	< .0002
SILVER, TR (MG/L AS AG)	< .005	IRON, TR (MG/L AS FE)	1.0
MANGANESE, TR (MG/L AS MN)	.15		

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 05 SAMPLER GLI HANDLING 5301 ANALYST JAH LAB WQBH
 COMPLETED 11-28-78 COMPUTER RUN 12/19/78 DATA 0975/PRG 0876 FUND 6053
 STD DEV. ION BALANCE 9.99 CA MG NA K CL SO4 HCO3 CO3 NO3
 SEGMENT MPDES 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 CALC. MEQ/L= INSUFFICIENT DATA 78W1900

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	463455N 113 234W	SAMPLE LOCATION	10N 12W 36A
STATION CODE		ANALYSIS NUMBER	78W1425
DATE SAMPLED	07-20-78	DRAINAGE BASIN	076G -CLARK FR R
TIME SAMPLED		WATER FLOW RATE	.3 CFS(M)
METHOD SAMPLED		FLOW MEASUREMENT METHOD	GURLEY METER
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE		TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY		SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: DUNKELBERG CREEK NEAR MOUTH

	MG/L	MEQ/L		MG/L	MEQ/L
LCIUM (CA)			BICARBONATE(HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	45.3	0.943
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		
SUM CATIONS	0.0	0.0	SUM ANIONS	45.3	0.943

LABORATORY PH	8.21	TOT HARDNESS(MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)	18.0	TOT ALKALINITY(MG/L-CACO3)	
SUM-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-UMHOS-25C	479.0	SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS	
SEDIMENT, TOT, SUSP (MG/L)	error
CADMIUM, TR (MG/L AS CD)	< .001
LEAD, TR (MG/L AS PB)	< .005
PHOSPHOROUS, TOT (MG/L-P)	.062
SILVER, TR (MG/L AS AG)	< .005
MANGANESE, TR (MG/L AS MN)	.040
ARSENIC, TR (MG/L AS AS)	.004
COPPER, TR (MG/L AS CU)	< .01
ZINC, TR (MG/L AS ZN)	.010
MERCURY, TR (MG/L AS HG)	< .0002
IRON, TR (MG/L AS FE)	.24

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO	SAMPLER	PCG	HANDLING	ANALYST	JH	LAB	WGBH
COMPLETED 11-15-78	COMPUTER RUN	11/27/78	DATA 0975/PROG 0876	FUND	6053		
STND DEV. ION BALANCE	9.69	CA	MG	NA	K	CL	SO4
SEGMENT	MPDES	0.0	0.0	0.0	0.0	0.010	0.0
CALC. MEQ/L= INSUFFICIENT DATA							0.0

78W1425

STATE HEALTH DEPT.

WATER QUALITY BUREAU

HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	GRANITE
LAT.-LONG.	461924N 1131725W	SAMPLE LOCATION	7N 14W 36ABA
STATION CODE		ANALYSIS NUMBER	78W1898
DATE SAMPLED	08-18-78	DRAINAGE BASIN	76GJ
TIME SAMPLED	1000	WATER FLOW RATE	2.2 CFS(M)
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	GURLEY METER
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: DOUGLAS CREEK BELOW TAILINGS

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	129.0	2.686
			FLUORIDE (F)		
			PHOSPHATE (PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	129.0	2.686
-------------	-----	-----	------------	-------	-------

LABORATORY PH	6.95	TOT HARDNESS (MG/L-CAC03)	
FIELD WATER TEMPERATURE (C)	11.5	TOT ALKALINITY (MG/L-CAC03)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-UMHOS-25C	324.4	SODIUM ADSORPTION RATIO	

A D D I T I O N A L P A R A M E T E R S

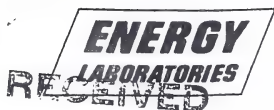
SEDIMENT, TOT, SUSP (MG/L)	8.9	ARSENIC, TR (MG/L AS AS)	.13
CADMIUM, TR (MG/L AS CD)	.008	COPPER, TR (MG/L AS CU)	.03
LEAD, TR (MG/L AS PB)	.022	ZINC, TR (MG/L AS ZN)	1.7
PHOSPHOROUS, TOT (MG/L-P)	.023	MERCURY, TR (MG/L AS HG)	< .0002
SILVER, TR (MG/L AS AG)	< .005	IRON, TR (MG/L AS FE)	.57
MANGANESE, TR (MG/L AS MN)	5.5		

REMARKS: FLINT CREEK STUDY

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)=MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 03	SAMPLER GLJ	HANCLING 5301	ANALYST JAH	LAB WQBH
COMPLETED 11-28-78	COMPUTER RUN	12/19/78	DATA 0975/PROG 0876	FUND 6053
STND DEV. ION BALANCE 9.99	CA	MG	NA	K
SEGMENT MPDES	0.0	0.0	0.0	0.0
CALC. MEQ/L= INSUFFICIENT DATA	0.0	0.0	0.0	0.0

78W1898

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MAY 30 1990

STATE LANDS

LABORATORY REPORT

TO: State of Montana
ADDRESS: Department of State Lands
Stu Levit
1625 11th Avenue
Helena, MT 59620

LAB NO.: 90-11973
DATE: 05/29/90 dya

SOIL ANALYSIS

Bedload Samples
Lower Willow Creek Above Combination Milling Site
Sampled 05/03/90 @ 1350
Submitted 05/10/90

<u>Total</u>	<u>µg/g</u>	<u>Detection Limit, µg/g</u>
Aluminum	6450	10
Arsenic	9	5
Barium	680	5
Cadmium	3	1
Chromium	6	3
Copper	66	2
Iron	12100	5
Lead	36	5
Manganese	2400	2
Nickel	13	3
Mercury	<1	1
Selenium	<5	5
Silver	<5	5
Zinc	110	2

NOTE: Analysis done by EPA method 3050.

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LABORATORY REPORT

TO: State of Montana
ADDRESS: Department of State Lands
Stu Levit
1625 11th Avenue
Helena, MT 59620

LAB NO.: 90-11974
DATE: 05/29/90 dya

SOIL ANALYSIS

Bedload Samples
Lower Willow Creek Above Combination Milling Site
Sampled 05/03/90 @ 1416
Submitted 05/10/90

<u>Total</u>	<u>µg/g</u>	<u>Detection Limit, µg/g</u>
Aluminum	2840	10
Arsenic	350	5
Barium	360	5
Cadmium	13	1
Chromium	4	3
Copper	2340	2
Iron	10300	5
Lead	2000	5
Manganese	1000	2
Nickel	<3	3
Mercury	48	1
Selenium	8	5
Silver	17	5
Zinc	150	2

NOTE: Analysis done by EPA method 3050.



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LABORATORY REPORT

TO: State of Montana
ADDRESS: Department of State Lands
Stu Levit
1625 11th Ave.
Helena, MT 59620

LAB NO: 90-11969
DATE: 05/25/90 bl

WATER ANALYSIS

Lower Willow Creek Below Combination Mill
Sampled 05/03/90
Submitted 05/10/90

<u>Constituent</u>	<u>mg/l</u>
Nitrate as N	0.27
Total Phosphorus as P	0.04

Dissolved:

Aluminum	0.2
Arsenic	<0.005
Barium	<0.1
Cadmium	<0.001
Chromium	<0.02
Copper	0.02
Iron	0.04
Lead	<0.01
Manganese	<0.02
Nickel	<0.03
Mercury	<0.001
Selenium	<0.005
Silver	<0.005
Zinc	<0.01



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LABORATORY REPORT

TO: State of Montana
ADDRESS: Department of State Lands
Stu Levit
1625 11th Ave.
Helena, MT 59620

LAB NO: 90-11970
DATE: 05/25/90 bl

WATER ANALYSIS

Lower Willow Creek Above Combination Milling Site
Sampled 05/03/90
Submitted 05/10/90

<u>Constituent</u>	<u>mg/l</u>
Nitrate as N	0.28
Total Phosphorus as P	0.04

Dissolved:

Aluminum	0.2
Arsenic	<0.005
Barium	<0.1
Cadmium	<0.001
Chromium	<0.02
Copper	<0.01
Iron	0.04
Lead	<0.01
Manganese	<0.02
Nickel	<0.03
Mercury	<0.001
Selenium	<0.005
Silver	<0.005
Zinc	<0.01



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LABORATORY REPORT

TO: State of Montana
ADDRESS: Department of State Lands
Stu Levit
1625 11th Ave.
Helena, MT 59620

LAB NO: 90-11970 dup
DATE: 05/25/90 bl

WATER ANALYSIS

Lower Willow Creek Above Combination Milling Site
Sampled 05/03/90
Submitted 05/10/90

<u>Constituent</u>	<u>mg/l</u>
Nitrate as N	0.28
Total Phosphorus as P	0.04
<u>Dissolved:</u>	
Aluminum	0.1
Arsenic	<0.005
Barium	<0.1
Cadmium	<0.001
Chromium	<0.02
Copper	<0.01
Iron	0.06
Lead	<0.01
Manganese	<0.02
Nickel	<0.03
Mercury	<0.001
Selenium	<0.005
Silver	<0.005
Zinc	<0.01



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LABORATORY REPORT

TO: State of Montana
ADDRESS: Department of State Lands
Stu Levit
1625 11th Ave.
Helena, MT 59620

LAB NO: 90-11971- 72
DATE: 05/25/90 bl

WATER ANALYSIS

Sampled 05/03/90
Submitted 05/10/90

<u>Lab No.</u>	<u>Identification</u>	<u>Total Suspended Solids, mg/l</u>
90-11971	Lower Willow Creek Below Combination Milling Site	7
90-11972	Lower Willow Above Combination Milling Site	7

COMBINATION MILL SITE
STREAM SEDIMENT SAMPLES

Sample #	Sample Location	Description
201	head of pool	approx. 1000 feet upstream (south) of bridge, above disturbance from mining and beavers.
202	mid pool	same
203	lower pool	same
204	west bank/point bar	same
205	east bank/point bar	same
206	head of pool	approx. 1500 feet downstream (north) of north property boundary.
207	mid pool	same
208	lower pool	same
209	west bank/point bar	same
210	east bank/point bar	same

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36335
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
201
Submitted 09/17/91

<u>Total Metals</u>	Detection <u>Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	5
Copper	5	30
Iron	5	7670
Lead	5	20
Manganese	5	1150
Mercury	2	<2
Zinc	5	99

Analysis done by EPA method 3050.

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36336
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
202
Submitted 09/17/91

<u>Total Metals</u>	<u>Detection Limit, $\mu\text{g}/\text{g}$ (ppm)</u>	<u>$\mu\text{g}/\text{g}$ (ppm)</u>
Arsenic	5	<5
Copper	5	27
Iron	5	7840
Lead	5	16
Manganese	5	1070
Mercury	2	<2
Zinc	5	82

Analysis done by EPA method 3050.

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36337
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
203
Submitted 09/17/91

<u>Total Metals</u>	Detection <u>Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	6
Copper	5	29
Iron	5	8060
Lead	5	33
Manganese	5	1070
Mercury	2	<2
Zinc	5	82

Analysis done by EPA method 3050.

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LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36338
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
204
Submitted 09/17/91

<u>Total Metals</u>	<u>Detection Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	8
Copper	5	40
Iron	5	9670
Lead	5	27
Manganese	5	1140
Mercury	2	<2
Zinc	5	90

Analysis done by EPA method 3050.



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LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36339
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
205
Submitted 09/17/91

<u>Total Metals</u>	<u>Detection Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	12
Copper	5	48
Iron	5	11200
Lead	5	26
Manganese	5	1020
Mercury	2	<2
Zinc	5	120

Analysis done by EPA method 3050.



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LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36340
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
.206
Submitted 09/17/91

<u>Total Metals</u>	Detection <u>Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	200
Copper	5	1100
Iron	5	12200
Lead	5	1580
Manganese	5	670
Mercury	2	14
Zinc	5	250

Analysis done by EPA method 3050.

LABORATORY REPORTTO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715LAB NO.: 91-36340 dup
DATE: 09/30/91 crpQUALITY ASSURANCE - DUPLICATE ANALYSISCombination Millsite - Project 88
206
Submitted 09/17/91

<u>Total Metals</u>	Detection <u>Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	180
Copper	5	1050
Iron	5	11800
Lead	5	1450
Manganese	5	650
Mercury	2	13
Zinc	5	220

Analysis done by EPA method 3050.

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36341
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
207
Submitted 09/17/91

<u>Total Metals</u>	Detection <u>Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	260
Copper	5	1280
Iron	5	11800
Lead	5	2190
Manganese	5	690
Mercury	2	21
Zinc	5	290

Analysis done by EPA method 3050.

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36342
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
208

Submitted 09/17/91

<u>Total Metals</u>	<u>Detection Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	130
Copper	5	650
Iron	5	8070
Lead	5	970
Manganese	5	360
Mercury	2	7
Zinc	5	240

Analysis done by EPA method 3050.

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36343
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
209
Submitted 09/17/91

<u>Total Metals</u>	<u>Detection Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	620
Copper	5	4200
Iron	5	18000
Lead	5	5610
Manganese	5	340
Mercury	2	54
Zinc	5	260

Analysis done by EPA method 3050.

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36344
DATE: 09/30/91 crp

SOIL ANALYSIS

Combination Millsite - Project 88
210
Submitted 09/17/91

<u>Total Metals</u>	<u>Detection Limit, $\mu\text{g/g}$ (ppm)</u>	<u>$\mu\text{g/g}$ (ppm)</u>
Arsenic	5	270
Copper	5	1420
Iron	5	15000
Lead	5	1450
Manganese	5	300
Mercury	2	22
Zinc	5	140

Analysis done by EPA method 3050.

LABORATORY REPORT

TO: Schafer and Associates
ADDRESS: Steven Smith
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-32875
DATE: 09/18/91 da

WATER ANALYSIS

Combination Mill
1A, Upper Willow Creek
Sampled 08/28/91 @ 9:45
Submitted 08/30/91

<u>Constituent</u>	<u>mg/l (ppm)</u>
Arsenic	<0.005
Cadmium	<0.001
Copper	0.01
Iron	0.03
Lead	<0.01
Manganese	<0.02
Mercury	<0.001
Silver	<0.005
Zinc	<0.01



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LABORATORY REPORT

TO: Schafer and Associates
ADDRESS: Steven Smith
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-32876
DATE: 09/18/91 da

WATER ANALYSIS

Combination Mill
1B, Lower Willow Creek
Sampled 08/27/91 @ 1955
Submitted 08/30/91

<u>Constituent</u>	<u>mg/l (ppm)</u>
Arsenic	<0.005
Cadmium	<0.001
Copper	0.05
Iron	0.08
Lead	<0.01
Manganese	0.02
Mercury	<0.001
Silver	<0.005
Zinc	<0.01

LABORATORY REPORT

TO: Schafer and Associates
ADDRESS: Steven Smith
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-32877
DATE: 09/18/91 da

WATER ANALYSIS

Combination Mill
2A, Upper Mill Creek
Sampled 08/28/91 @ 1020
Submitted 08/30/91

<u>Constituent</u>	<u>mg/l (ppm)</u>
Arsenic	<0.005
Cadmium	<0.001
Copper	0.01
Iron	0.14
Lead	<0.01
Manganese	0.03
Mercury	<0.001
Silver	<0.005
Zinc	<0.01



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LABORATORY REPORT

TO: Schafer and Associates
ADDRESS: Steven Smith
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-32878
DATE: 09/18/91 da

WATER ANALYSIS

Combination Mill
2B, Lower Mill Creek
Sampled 08/27/91 @ 1930
Submitted 08/30/91

<u>Constituent</u>	<u>mg/l (ppm)</u>
Arsenic	0.007
Cadmium	0.006
Copper	0.61
Iron	0.09
Lead	0.01
Manganese	0.19
Mercury	0.001
Silver	<0.005
Zinc	0.23



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P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-40621
DATE: 11/01/91 rh

SOIL ANALYSIS

36272, 88-1B
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	187
Copper	1450
Iron	6740
Lead	1940
Mercury	7
Silver	54
Zinc	146

NOTE: Analysis done by EPA method 3050.



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LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-40622
DATE: 11/01/91 rh

SOIL ANALYSIS

36275, 88-3B
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	445
Copper	1080
Iron	10400
Lead	3180
Mercury	2
Silver	66
Zinc	116

NOTE: Analysis done by EPA method 3050.



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LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-40623
DATE: 11/01/91 rh

SOIL ANALYSIS

36276, 88-4A
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	613
Copper	1830
Iron	13600
Lead	4860
Mercury	34
Silver	494
Zinc	430

NOTE: Analysis done by EPA method 3050.



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LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-40624
DATE: 11/01/91 rh

SOIL ANALYSIS

36277, 88-5A
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	469
Copper	1340
Iron	17300
Lead	4640
Mercury	15
Silver	573
Zinc	403

NOTE: Analysis done by EPA method 3050.



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LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-40625
DATE: 11/01/91 rh

SOIL ANALYSIS

36278, '88-6A
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	733
Copper	2890
Iron	8240
Lead	8150
Mercury	124
Silver	70
Zinc	221

NOTE: Analysis done by EPA method 3050.



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LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-40626
DATE: 11/01/91 rh

SOIL ANALYSIS

36279, 88-7A
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	457
Copper	3860
Iron	10000
Lead	5220
Mercury	71
Silver	44
Zinc	285

NOTE: Analysis done by EPA method 3050.



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FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

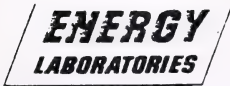
LAB NO.: 91-40627
DATE: 11/01/91 rh

SOIL ANALYSIS

36281, 88-8B
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	1090
Copper	8410
Iron	24600
Lead	21300
Mercury	393
Silver	133
Zinc	832

NOTE: Analysis done by EPA method 3050.



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FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-40628
DATE: 11/01/91 rh

SOIL ANALYSIS

36283, 88-9A
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	260
Copper	1940
Iron	9900
Lead	2440
Mercury	64
Silver	21
Zinc	194

NOTE: Analysis done by EPA method 3050.



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LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-40629
DATE: 11/01/91 rh

SOIL ANALYSIS

36284, 88-10A
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	1150
Copper	8650
Iron	11400
Lead	20500
Mercury	80
Silver	42
Zinc	256

NOTE: Analysis done by EPA method 3050.



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FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-40630
DATE: 11/01/91 rh

SOIL ANALYSIS

36285, 88-11A
Digested 10/23/91
Submitted 10/22/91

<u>Total Metals:</u>	<u>µg/g(ppm)</u>
Arsenic	548
Copper	591
Iron	6170
Lead	5480
Mercury	15
Silver	14
Zinc	302

NOTE: Analysis done by EPA method 3050.



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FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36271 -73
DATE: 10/04/91 crp

SOIL ANALYSIS

Sampled 08/27/91
Submitted 09/17/91

page 1

Sample No.	36271	36272	36273
Location	Combination	Combination	Combination
	88-1 A	88-1 B	88-1 C
Lime, % as CaCO ₃	<0.1	<0.1	<0.1
Neut. Pot., (1)	<1	<1	<1
Acid Pot., meq/100g	4	16	0
Acid/Base Pot., (1)	-2	-8	0
Total Sulfur %	0.08	0.35	<0.01
Hot H ₂ O Extractable Sulfur %	0.02	0.09	<0.01
HCl Extractable Sulfur %	0.03	<0.01	<0.01
HNO ₃ Extractable Sulfur %	0.03	0.24	<0.01
Residual Sulfur, %	<0.01	0.02	<0.01
(1) Tons/1000 Tons			

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36274 -76
DATE: 10/04/91 crp

SOIL ANALYSIS

Sampled 08/27/91
Submitted 09/17/91

page 2

Sample No.	36274	36275	36276
Location	Combination	Combination	Combination
	88-2 A	88-3 B	88-4 A
Lime, % as CaCO ₃	<0.1	<0.1	<0.1
Neut. Pot., (1)	<1	<1	<1
Acid Pot., meq/100g	3	4	9
Acid/Base Pot., (1)	-2	-2	-5
Total Sulfur %	0.07	0.07	0.20
Hot H ₂ O Extractable Sulfur %	0.02	0.01	0.05
HCl Extractable Sulfur %	<0.01	0.02	0.12
HNO ₃ Extractable Sulfur %	0.03	0.02	<0.01
Residual Sulfur, %	0.02	0.02	0.03

(1) Tons/1000 Tons



ENERGY LABORATORIES, INC.

P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36277 -79
DATE: 10/04/91 crp

SOIL ANALYSIS

Sampled 08/27 & 28/91
Submitted 09/17/91

page 3

Sample No.	36277	36278	36279
Location	Combination	Combination	Combination
	88-5 A	88-6 A	88-7 A
Lime, % as CaCO ₃	<0.1	<0.1	<0.1
Neut. Pot., (1)	<1	<1	<1
Acid Pot., meq/100g	16	6	4
Acid/Base Pot., (1)	-8	-3	-2
Total Sulfur %	0.41	0.16	0.11
Hot H ₂ O Extractable Sulfur %	0.16	0.07	0.05
HCl Extractable Sulfur %	0.18	0.05	<0.01
HNO ₃ Extractable Sulfur %	0.01	0.01	0.06
Residual Sulfur, %	0.06	0.03	<0.01
(1) Tons/1000 Tons			

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36280 -82
DATE: 10/04/91 crp

SOIL ANALYSIS

Sampled 08/28 & 29/91
Submitted 09/17/91

page 4

Sample No. Location	36280 Combination 88-8 A	36281 Combination 88-8 B	36282 Combination 88-8 C
Lime, % as CaCO ₃	<0.1	<0.1	<0.1
Neut. Pot., (1)	<1	<1	<1
Acid Pot., meq/100g	5	32	0
Acid/Base Pot., (1)	-3	-16	0
Total Sulfur %	0.13	0.58	<0.01
Hot H ₂ O Extractable Sulfur %	0.05	0.07	<0.01
HCl Extractable Sulfur %	<0.01	0.31	<0.01
HNO ₃ Extractable Sulfur %	0.07	0.12	<0.01
Residual Sulfur, %	0.01	0.08	<0.01

(1) Tons/1000 Tons



ENERGY LABORATORIES, INC.

P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6186
Bozeman, MT 59715

LAB NO.: 91-36283 -85
DATE: 10/04/91 crp

SOIL ANALYSIS

Sampled 08/28/91
Submitted 09/17/91

page 5

Sample No.	36283	36284	36285
Location	Combination 88-9 A	Combination 88-10 A	Combination 88-11 A
Lime, % as CaCO ₃	<0.1	<0.1	<0.1
Neut. Pot., (1)	<1	<1	<1
Acid Pot., meq/100g	0	14	4
Acid/Base Pot., (1)	0	-7	-2
Total Sulfur %	0.05	0.28	0.13
Hot H ₂ O Extractable Sulfur %	0.05	0.05	0.07
HCl Extractable Sulfur %	<0.01	0.14	0.06
HNO ₃ Extractable Sulfur %	<0.01	0.04	<0.01
Residual Sulfur, %	<0.01	0.05	<0.01

(1) Tons/1000 Tons



ENERGY LABORATORIES, INC.

P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Schafer & Associates
ADDRESS: Bruce Parker
P.O. Box 6166
Bozeman, MT 59715

LAB NO.: 91-36271 -85
DATE: 10/04/91 crp

SOIL ANALYSIS

Submitted 09/17/91

page 6

Sample No. 36280DUP
Location Combination
88-8 A

Lime, % as CaCO ₃	<0.1
Neut. Pot., (1)	<1
Acid Pot., meq/100g	6
Acid/Base Pot., (1)	-3
Total Sulfur %	0.11
Hot H ₂ O Extractable Sulfur %	0.01
HCl Extractable Sulfur %	<0.01
HNO ₃ Extractable Sulfur %	0.08
Residual Sulfur, %	0.02
(1) Tons/1000 Tons	

**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**COMBINATION
PA NO. 20-009**

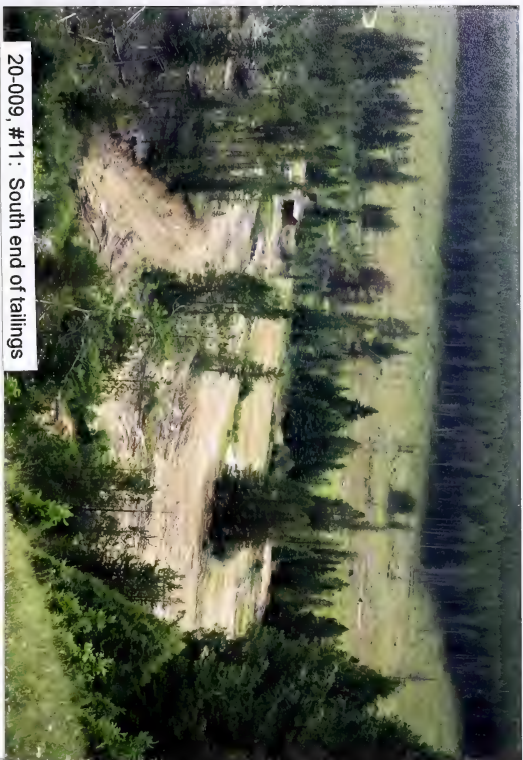
AIMSS SCORESHEET

 SITE NAME:
 PA NUMBER:

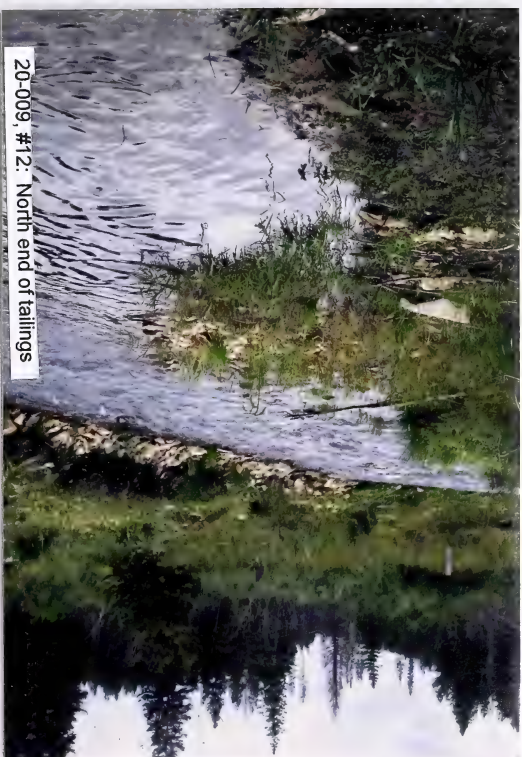
 COMBINATION MILL
 20-009

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	565.754
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		0
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	2.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	565754
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		50
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	750
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	621.527
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		3
18	SW - TARGETS	WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	26
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	12119777
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	20.718
29		POPULATION - 4 MILES		1
30	AIR - TARGETS	NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	16
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	16574
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	25
38		LIKELIHOOD SCORE	LINES 36 + 37C	25
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	18.859
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	0
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			127.02
	(LINES 10 + 24 + 35 + 44) / 100,000			

LINE NO.	SITE SAFETY		SITE NAME: PA NUMBER:	COMBINATION MILL 20-009
	THREAT	ACCESSIBILITY		
1		OPEN SHAFTS	100 EA.	5
2		OPEN ADITS	50 EA.	0
3	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
4		HAZ. STRUCTURES	40 EA.	0
5		EXPLOSIVES		0
6		HAZ. MATERIALS		100
7		HAZARDS SCORE	SUM LINES 2 - 7	100
8	TARGETS	POPULATION - 1 MILE		0
9		NEAREST RESIDENCE		0
10		RECREATIONAL USE		0
11		TARGETS SCORE	SUM LINES 9 - 11	0
12		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	0.00



20-009, #11: South end of tailings



20-009, #12: North end of tailings



20-009, #13: North end of mill with UNK-1 container



20-009, #14: Panorama of millsite (1 of 2)



20-009, #7: SW-1 sample location



20-009, #9: SW-2 sample location



20-009, #8: Junction of Mill Creek and South Fork Willow Creek



20-009, #10: SW-3 sample location



20-009, #15: Panorama of millsite (2 of 2)



20-009, #16: Inside container identified as UNK-1

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: FOREST ROSE PA#: 20-004

Date: June 29, 1993 Time: 0915

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer
Clark, Pioneer

Visitors: Earl McCurley, Tim Pfahler; MDSL
4 Unidentified MT Tech. Representatives
2 Unidentified USFS Surveyors
1 Unidentified USFS Abandoned Mines Specialist

Weather/Seasonality Observations: Partly cloudy; breezy; cool
(55°F); storm the previous day, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: SW-1 sample
location; #2: SW-2 sample location; #5: Breach in TP-3 dam; #6: TP-
3; #7: TP-2; #8: TP-1 erosion gully; #9: Mill building; #23: WR-4,
facing west; #24: WR-2, facing southwest; #25: WR-1 and SW-2 sample
location; #26: GW-1 sample location. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms):
White powder by north end of mill building approximately 3 cubic
yards present with pH of 10 - possible CaCO₃.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remediation Alternatives: Additional
study and remedial design necessary. Must construct a stabilized
drainage and also stabilize tailings impoundments.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): FOREST ROSE PA#: 20-004

Legal Description: T 9N ; R 12W ; Sec. 22 , NW 1/4 SE 1/4 1/4

County: GRANITE Mining District: DUNKLEBURG

Latitude: N 46° 30' 29" Longitude: W 113° 05' 21"

Primary Drainage Basin and Code: Clark Fork River/17010202

Secondary Drainage Basin: Dunkleburg Creek

USGS Quadrangle map name(s): Dunkleburg Creek, Montana

Mine Type/Commodities: Hardrock/Lead, Zinc, Silver

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public

Owner, Agent, or Contact (Include address and phone when available): John Alley, 821

W. Porphyry, Butte, MT 59701. (406) 782-7728; Alberta

Trescothick, 521 S. Clark, Butte, MT 59701. (406) 782-4534;

Richard Fausner, 406 Ridgewood Drive, Rome, NY 13440; Dorothy

Snyder, Rd 1, Volant, PA 16156. (412) 533-2261; Donald Moore, Rd

1 Box 580, New Wilmington, PA 16142. (412) 946-2853; Charles

O'Neil, O'Neil Drive, Butte, MT 59701; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Ore at
Wasa mine is of same type. Wasa ore was reportedly transported to
the Forest Rose for milling.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? USFS cleanup is in planning stages.
Interim action conducted in summer of 1993 to attempt to stabilize
lower tailings impoundment.

General site features: Elevation 5400' , Slope 5°-25° ,
Aspect Southwestern

Land use: Mining , Recreational X , Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? > 10 acres.
Dimensions:

Predominant vegetation types: Douglas fir, cottonwoods, aspen,
Ponderosa pine

Access: roads - good , poor X , 4wd , trail .
Other logistical considerations (proximity to other sites). Wasa
mine is in reasonably close proximity.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Site lies in the valley of Dunkleburg
Crk. which flows south through the site. Forest Rose mine is
located on a limestone member of the Kootenai Formation. Ore is
located on or near the Dunkleburg Anticline. The limestone mem-
ber is overlain by black shale member of the Blackleaf Formation.

Mining/milling history, ore type/tenor, host rock, gangue:
Mining began in 1890's. Mineralization occurred in and adjacent
to a gastropod-bearing limestone member of Kootenai Formation.
Deposits are irregular replacement deposits in the limestone.
Ore is located in and near the area of Dunkleburg Anticline. By
1916 only a few workings were accessible. Gangue mineral is
quartz, limonite, carrying silver-bearing galena, pyrite, lead
carbonate. Mine may have reopened in 1917.

Mine Operation?

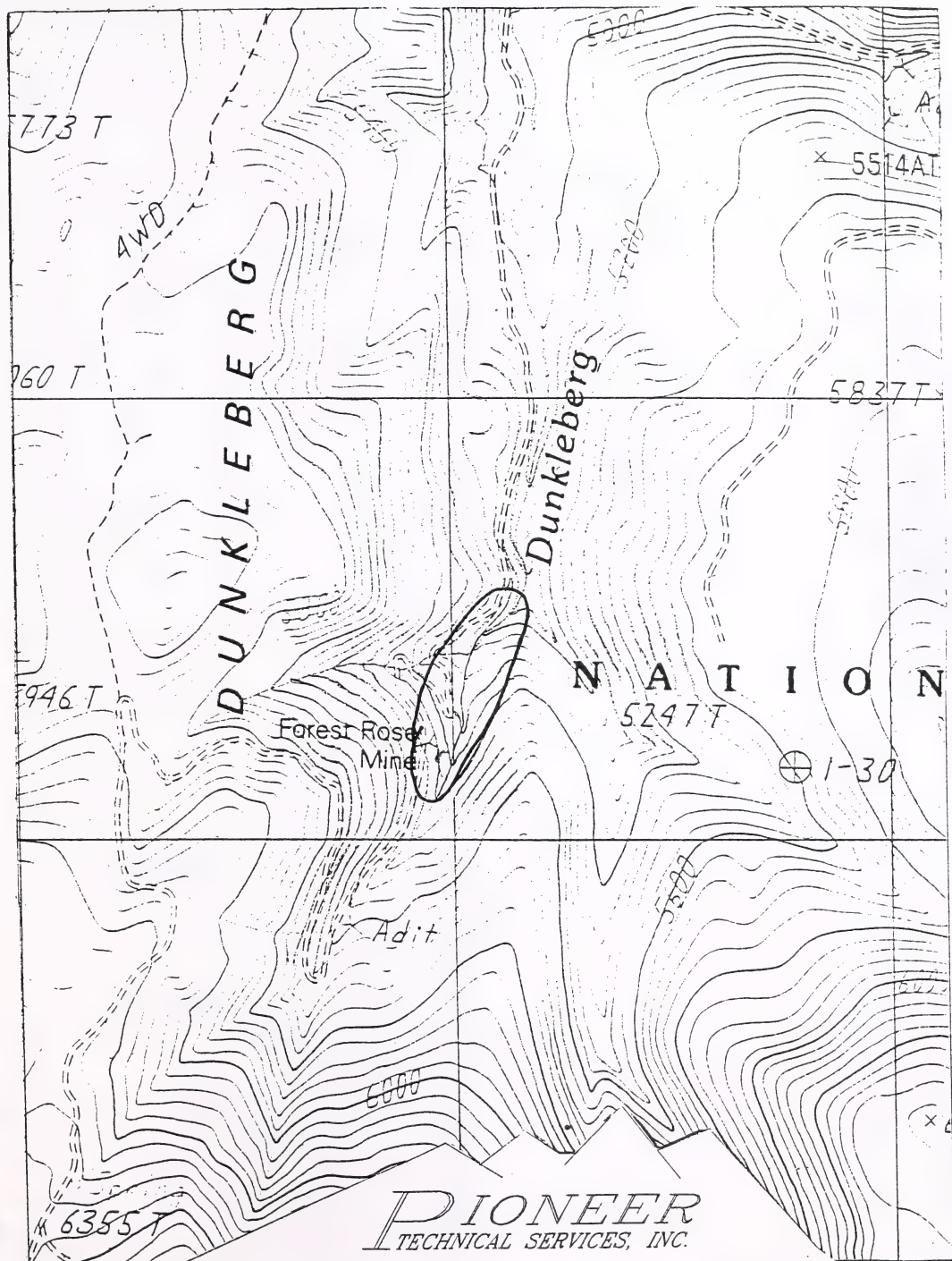
Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 3, Comment 1 caved; 2 open
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three
questions:

Period(s) of Operation: Mill operation dates were not found in the
literature.

Origin of Ore Milled - Custom Mill X Dedicated Mill ; Number and
names of mines that supplied mill feed: Forest Rose/Wasa - a
differential floatation plant 100 ton/day.

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
Differential floatation

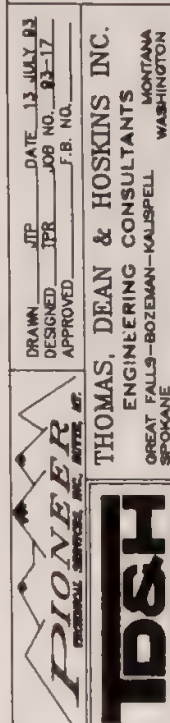


PIONEER
TECHNICAL SERVICES, INC.

FOREST ROSE, P.A. NO. 20-004

T09N, R12W, SECTION 22

SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
FOREST ROSE PA# 20-004
DUNKELBERG DISTRICT GRANITE COUN

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Medium sand, silty sand, clay

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Depth of ponds range to 35 feet deep.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): TP-1, mostly dry; TP-2, center wet, edges dry; TP-3, wet

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): TP-1, washed out; TP-2, in place, but possibly unstable; TP-3, recently breached, possible additional sluffing due to saturation.

Comments on potential for mitigation: Detailed remedial design is necessary.

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Flammang, Clark*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	PH (D)	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	3,000	Eastern lobe of south face of WR-1	None	6.88 (S)	0.055	20-004-WR-1	06/29/93 1900	T-Metals, ABA
WR-1B	WR		Central lobe of south face of WR-1	None	6.5 (D)	0.03			
WR-1C	WR		Western lobe of south face of WR-1	None	6.6 (D)	0.025			
WR-2A	WR	2,000	Ties on west side of valley south of WR-1; hole on south end	None	6.6 (D)	0.05			
WR-2B	WR		Ties on west side of valley south of WR-1; north end	None	6.4 (D)	0.04			
WR-3A	WR	2,000	WR south of mill building; southern most hole	None	4.7 (D)	0.025	20-004-WR-3	06/29/93 1900	T-Metals, ABA
WR-3B	WR		Adjacent to loadout next to mill building on south	None	5.8 (D)	0.030			
WR-3C	WR		Lower part of WR-3 in unvegetated part	None	6.2 (D)	0.030			
WR-4A	WR	1,000	Upper most waste rock dump above mill building; north end	None	6.1 (D)	0.03	20-004-WR-4	06/29/93 1900	T-Metals, ABA
WR-4B	WR		Upper most waste rock dump above mill building; south end	None	4.8 (D)	0.03			
UNK-1	OTH		First collapsing wood structure adjacent to south end of WR-4	None	5.4 (D)	0.035	N/A		
TP-1A-A	TAIL	4,000	TP-1A - 0'-3'; south side of pond	None	6.4 (D)	0.03	20-004-TP-1	06/29/93 1900	T-Metals, ABA
TP-1A-B	TAIL		TP-1A - 4'-8'; south side of pond	None	6.7 (D)	0.03			
TP-1A-C	TAIL		TP-1A - 8'-12'; south side of pond	None	5.2 (D)	0.02			
TP-1A-D	TAIL		TP-1A - 12'-13'; south side of pond	None	6.0 (D)	0.03			

* Direct reading (beta-gamma); S-Saturated State (Oxide State)

Comments or deviations from SOPs: 20-004-WR-1 is composite of WR-1A through -1C, and WR-2A and -2B. 20-004-WR-3 is composite of WR-3A through -3C. 20-004-WR-4 is composite of WR-4A and -4B. 20-004-TP-1 is composite of TP-1A-A through -1A-D, and TP-1B-A through -1B-F.

WR-1 extends across valley blocking the drainage.

*Continued on next page

SOURCE INVENTORY FORM (Cont'd)

SAMPLERS: Bullock, Flammang, Clark

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
TP-1B-A	TAIL		East side of pond TP-1B - 1'-3'	None	4.9 (D)	0.03			
TP-1B-B	TAIL		TP-1B - 4'-6'	None	5.4 (D)	0.03			
TP-1B-C	TAIL		TP-1B - 7'-9'	None	5.2 (D)	0.025			
TP-1B-D	TAIL		TP-1B - 10'-12'	None	5.2 (D)	0.025			
TP-1B-E	TAIL		TP-1B - 13'-15'	None	5.9 (D)	0.025			
TP-1B-F	TAIL		TP-1B - 16'-19'	None	6.4 (D)	0.025			
TP-2A-A	TAIL	11,000	Southwest in pond TP-2A - 0'-5'	None	5.6 (D)	0.04	20-004-TP-2	06/29/93 1800	T-Metals, ABA
TP-2A-B	TAIL		TP-2A - 5'-8.5'	None	5.2 (D)	0.04			
TP-2A-C	TAIL		TP-2A - 8.5'-12'	None	5.3 (D)	0.05			
TP-2B-A	TAIL		Northeast end of pond TP-2B - 0'-1'	Impoundment	4.6 (D)	0.04			
TP-2B-B	TAIL		TP-2B - 1'-2'	Impoundment	5.3 (D)	0.05			
TP-2B-C	TAIL		TP-2B - 2'-14'	Impoundment	4.2 (D)	0.05			
TP-2B-D	TAIL		TP-2B - 14'-17'	Impoundment	N/A	N/A			
TP-3A-A	TAIL	8,000	South end TP-3A - 0'-2'	Breached Impoundment	4.3 (D)	0.04	20-004-TP-3	06/29/93 1800	T-Metals, ABA
TP-3A-B	TAIL		TP-3A - 2'-9'	Breached Impoundment	4.4 (D)	0.03			
TP-3B-A	TAIL		North end TP-3B - 0'-3'	Breached Impoundment	< 3.5 (D)	0.04			
TP-3B-B	TAIL		TP-3B - 3'-8'	Breached Impoundment	4.0 (D)	0.04			
TP-3B-C	TAIL		TP-3B - 8'-15'	Breached Impoundment	5.2 (D)	0.04			

* Direct reading (beta Meter); B Detected Beta (Clos. Meter)

Comments or deviations from SOPs: 20-004-TP-2 is composite of TP-2A-A through -2A-C, and TP-2B-A through -2B-C. 20-004-TP-3 is composite of TP-3A-A and -3A-B, and TP-3B-A through -3B-C.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No , Number: 1 Identification: Adit #1

Filled shafts: Yes , No X, Number: Identification:

Seeps/Springs: Yes X, No , Number: 1 Identification: Seeps near mill at toe of WR-1

Groundwater wells within 4 miles?: Yes X, No ;
Number of well logs: 21

Distance to nearest well used for drinking? Approximately 2 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable X, Possible , Unlikely .

Large volume of contaminated media with water percolating through it
May also be in contact with shallow alluvial groundwater.

Other observations/notes: N/A

SAMPLERS: Bullock, Flammang

NOTE: Estimated (E) or Measured (M) from edit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Dunkleberg Creek, both above and below site; water flows under TP-2 and -3 in wooden culverts.

Dry streambeds: Yes X, No , Name(s): Dunkleberg Creek, for approx. 250' above WR-2; no water appears to flow on surface.

Other surface water: Yes X, No , Name(s)/Description: Standing ponds on TP-2 and -3 seep emerging near mill (north) and at toe of WR-1.

Waste materials within any floodplain: Yes X, No Source ID(s): WR-1 and -2; TP-1, -2, and -3

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.3 during investigation
High Flow: 5 cfs, Average Flow: 0.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; water stands and flows on TP-2 and -3; water seeps from base of WR-1; seep by mill flows across tailings cont. soil and down TP-1.

Surface water draining onto or through waste sources: Yes X, No , Describe: Water issues from wooden culverts on TP-2 and -3 and flows across ponds; standing water on TP-2 and -3; seep from toe of WR-1; seep by mill flows across spilled tailings and down to TP-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, stock watering, riparian, wetlands, fishery

Observed erosional/sedimentation/stream turbidity problems? Yes X, No , Distance downstream (ft)? >1000 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Stream very turbid and silty below TP-3 due to a recent breach in the tailings impoundment.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Flammang

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu\text{S/cm}$ e 25°C	Rh mv	Temp °C	ALK. mg/L as CaCO ₃	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
SW-1	SW	Downstream of breached dam on TP-3	7.53	690	-20	9	169	0.5 cfs (M)	20-004-SW-1	06/29/93 1500	T-Metals, TDS, Hardness, Cl, SO ₄ , NO ₂ /NO ₃
SE-1	SE	Downstream of breached dam on TP-3	N/A	N/A	N/A	N/A	N/A	N/A	20-004-SE-1	06/29/93 1500	T-Metals
SW-2	SW	At toe of WR-1	7.71	430	207	5.0	128	5 gpm (E)	20-004-SW-2	06/29/93 1700	T-Metals, TDS, Hardness, Cl, SO ₄ , NO ₂ /NO ₃
SE-2	SE	At toe of WR-1	N/A	N/A	N/A	N/A	N/A	N/A	20-004-SE-2	06/29/93 1700	T-Metals
SW-3	SW	Approx. 400' upstream of end of WR-2	8.08	400	128	5.25	130	0.20 cfs (M)	20-004-SW-3	06/29/93 1715	T-Metals, TDS, Hardness, Cl, SO ₄ , NO ₂ /NO ₃
SE-3	SE	Approx. 400' upstream of end of WR-2	N/A	N/A	N/A	N/A	N/A	N/A	20-004-SE-3	06/29/93 1715	T-Metals
SE-250	SE	250' downstream of SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-500	SE	500' downstream of SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-750	SE	750' downstream of SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000' downstream of SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M) ?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 to 10 acres in valley bottom approximately 200 feet below the lower tailings pond is potentially suitable for wetlands treatment.

Wetlands present: Yes X, No , Describe: Small wetlands present on surface of TP-3.

Carbonate rocks/soils: Yes X, No , Describe: Limestone is present on dumps.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X; 10-30 ; 30-100 ; 100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ; Comments

Nearest residence(ft or miles)? Approximately 1.23 miles (seasonal?)

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Flammang

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/RISE/NO RATE/LOW/HIGH)
TP-1	pH	Partial	19,800	17,820	Yes	High
TP-2	pH	Partial	52,200	44,370	Yes	High
TP-3	pH	Wet	29,700	17,820	Yes	High
WR-1	SO3 (minor)	Dry	25,200	20,160	Yes	Low
WR-2	SO3 (minor), pH	Dry	5,220	4,698	Yes	Low
WR-3	SO3	Dry	20,700	16,560	Yes	Moderate
WR-4	SO3, pH	Dry	2,520	2,520	Yes	Moderate
UNK-1	None	Dry	100	50	Yes	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe: _____

Population within 1 mile: 1-10____; 10-30____; 30-100____; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments None

Evidence of recreational use on site: Yes X, No____, Describe: Beer
cans

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes____, No X, Comment _____
Wilderness Area - Yes____, No X, Comment _____
T&E Species Habitat - Yes____, No X, Comment _____
Bat Habitat - Yes____, No X, Comment _____

Primary Drainage____; Secondary Drainage____; No Information X :

Riparian Habitat Quality - High____, Medium____, Low____
Wetlands Frontage - High____, Medium____, Low____
Fisheries Habitat and Species Classification - ____
Sport Fishery Classification - ____

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 1, types and locations:____
Adit, top of site 409' north of WR-4

Hazardous structures: Yes X, No____, Number 12+, types and locations:____
Every structure on the site is in the process of collapsing.

Unstable highwalls, pits, trenches, slopes: Yes____, No X, Number____,
types and locations: _____

Unstable waste piles, impoundments, undercut banks: Yes X, No____,
Number 2, types and locations: TP-3 has recently breached and
additional tailings may be washed into the creek. TP-2 appears to be
constructed in the same manner as TP-3 and may also have potential to
fail.

Fire and/or Explosion hazards: Yes____, No X, Explain: _____

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- USDA/FS, Analysis for the Dunkleburg Creek Area, Written by M. Burnside, June 3, 1993.
- USDA/FS, Memorandum to John Koerth, MDSL, Regarding Forest Rose Water/Soil Data, June 16, 1993.
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LABORATORY ANALYTICAL DATA

FOREST ROSE
PA NO. 20-004

Forest Rose PA# 20-004
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/29/93

SOLID MATRIX ANALYSES

FIELD ID	Results per dry weight basis													
	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-004-SE-1	116 JX	65.8	14.8 J	11.1 J	19.9 J	125	45600 J	0.13	1370 J	34 J	1010 J	4 U	2040 J	NR
20-004-SE-2	51 JX	25.6	22 J	3 J	3.3 J	53.7	13700 J	0.1	1310 J	17 J	428 J	4 U	1270 J	NR
20-004-SE-3	87 JX	118	13.5 J	9.5 J	16.2 J	41.7	43200 J	0.049	819 J	34 J	2820 J	6 J	2230 J	NR
20-004-TP-1	336 JX	37.6	58.2 J	2 J	3.8 J	38800 J	0.342	0.342	2090 J	15 J	6810 J	49 J	7430 J	NR
20-004-TP-2	444 JX	15	14.3 J	11.2 J	4.4 J	563	109000 J	0.377	1720 J	28 J	1820 J	28 J	16800 J	NR
20-004-TP-3	330 JX	12.2	65.1 J	14.3 J	3.4 J	404	113000 J	0.052	1730 J	29 J	690 J	9 J	6590 J	NR
20-004-WR-1	227	13.1	40.9	8.6	2.9	208	39200	0.648 J	1110	29	4570	24 J	5660	NR
20-004-WR-3	801 JX	31.2	47.7 J	3.5 J	4 J	1770	75700 J	2.93	15 J	15 J	60400 J	470 J	51500 J	NR
20-004-WR-4	350 JX	23.1	3.2 J	4 J	3 J	526	164000 J	0.934	165 J	16 J	242 J	7 J	2840 J	NR
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR

U = Not Detected; J = Estimated Quantities; X = Outlier for Accuracy or Precision; NR = Not Reported

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL				PYRITIC				SULFUR			
	TOTAL Sulfur %	ACID BASE POTENTIAL u/1000t	NEUTRAL POTENTIAL u/1000t	SULFUR POTENTIAL u/1000t	Pyritic Sulfur %	Pyritic Sulfur u/1000t	Organic Sulfur %	Organic Sulfur u/1000t	Pyritic Sulfur u/1000t	Pyritic Sulfur u/1000t	Acid Base Pot. u/1000t	Acid Base Pot. u/1000t
20-004-TP-1	5.86	187	590	423	1.94	2.48	0.94	77.5	513			
20-004-TP-2	13.8	430	265	-185	<0.01	16	2.8	499	-234			
20-004-TP-3	13.7	429	265	-183	<0.01	16	2.8	500	-235			
20-004-TP-3DUP	13.3	416	186	-224	<0.01	14.6	1.94	456	-265			
20-004-WR-1	4.76	149	355	206	3.31	0.09	1.36	2.81	352			
20-004-WR-3	7.67	240	64.3	-175	2.71	2.89	2.07	90.3	-26			
20-004-WR-4	6.63	207	-5.6	-213	0.06	4.95	1.62	155	-160			

WATER MATRIX ANALYSES

FIELD ID	Metals in Water				Results in ug/L										HARDNESS CALC.	Zn (mg CaCO3/L)
	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb				
20-004-GW-1	3 J	22.6 JX	4.1 J	9.7 U	6.83 U	4.1 J	113	0.038 U	35.5	12.7 U	3.86	30.7 U	1700	258		
20-004-SW-1	6.45	82.2	3.7 J	7.63 JX	17.9	31.9	16100	0.038 U	453	24.2	68.7	23.8	474	358		
20-004-SW-2	1.92	13.3	2.55 U	5.99 UX	8.83	1.43	104	0.038 U	7.47	9	9.13	18.3 U	374	199		
20-004-SW-3	1.41	11.3	3.3 J	5.99 UX	5.27	5.7	54.5	0.038 U	6.07	8.78 U	1.73	19.4	346	175		

U = Not Detected, J = Estimated Oxidize, X = Outlier for Accuracy of Precision, ND = Not Reported

LEGEND

SE1 - Downstream of breached dam on tailings pond 3.
SE2 - At toe of waste rock dump 1.
SE3 - Approx. 400' upstream of end of waste rock dump 2.
TP1 - Composite of subsamples TP1A-A, 1A-B, 1A-C, 1A-D, 1B-A, TP2DUP - Duplicate of sample 20-004-TP-2.
1B-B, 1B-C, 1B-D, 1B-E, and 1B-F.
TP2 - Composite of subsamples TP2A-A, 2A-B, 2A-C, 2B-A, SW1 - Discharge from adit #1.
2B-B, and 2B-C.
TP3 - Composite of subsamples TP3A-A, 3A-B, 3B-A, 3B-B, and 3B-C.
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, and 2B.
WR3 - Composite of subsamples WR3A, 3B, and 3C.
WR4 - Composite of subsamples WR4A and 4B.
BACKGROUND - From the Jackson Park Mine (20-027-S8-1).
TP2DUP - Duplicate of sample 20-004-TP-3.
GW1 - Discharge from adit #1.
SW1 - Same as sample SE1.
SW2 - Same as sample SE2.
SW3 - Same as sample SE3.

Wet Chemistry Results in mg/l

FIELD ID	TOTAL				NO3/NO2-N CYANIDE			
	DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE			
20-004-GW-1	309	< 5.0	78	0.1	NR			
20-004-SW-1	448	< 5.0	160	0.07	NR			
20-004-SW-2	250	< 5.0	77	< 0.05	NR			
20-004-SW-3	224	< 5.0	50	0.06	NR			

XRF ANALYSIS RESULTS

FOREST ROSE
PA NO. 20-004

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-004-SE-1000		10514.6	23438.9	2055.02		1015.35	27184.8	241.445 *		631.804		193.426
20-004-SE-250		12448.9	14496.8	2786.93		1490.59	33220.6		78.9307 *	1290.23	40.8571 *	198.118
20-004-SE-500		9592.63	18363	1789.41		854.535	23357.3			478.025		168.024
20-004-SE-750		8775.75	12252.1	1438.87		681.78 *	22854.9			404.678		126.503
20-004-TP1A-A		2570.78	182865	269.694 *		1732.56	30728.5		239.298	4679.07		342.698
20-004-TP1A-B		175468	316.549 *	175468		1933.19	19924.7		336.493	4401.58		360.136
20-004-TP1A-C		2989.91	188664	482.298		2266.55	33416.4		237.398	3446.95		376.115
20-004-TP1A-D	217.947 *	16676.6	38550.5	3170.88		935.495	30188.4		206.932	2986.63		172.133
20-004-TP1B-A		2586.6	167371	380.578 *		1735.32	30594.8	247.108 *	225.838	5786.32		375.108
20-004-TP1B-B		1823.03 *	176659	279.489 *		2162.13	32593.6	364.794 *	180.784	4287.79		373.043
20-004-TP1B-C		2183.15	165033	342.176 *		1465.21	25587	315.758 *	151.455 *	3289.72		340.305
20-004-TP1B-D		4071.66	105000	420.995		1940.49	20424.7		232.006	3921.23		287.692
20-004-TP1B-E		6127.28	204593	505.785 *		2444.39	22126.5		342.571	3881.87		370.303
20-004-TP1B-F		3826.05	203863	445.565 *		2550.42	30784.2		469.338	9551.56		385.721
20-004-TP2A-A		3532.16	192799	563.53		1879.01	30174.1		318.461	5174.5		356.637
20-004-TP2A-B		3264.97	88860.1	314.622 *		1271.61	70589.9	336.207 *	367.139	33325.4	374.948	193.431
20-004-TP2A-C		10893.6	81257.2	730.914		2351.75	80105.2		397.165	9892.79	126.787 *	129.407
20-004-TP2B-A		8484.09	41618.9	853.271			71067.8		109.935 *	1589.13	199.338	32.0975
20-004-TP2B-B		4284.21	61650.5	512.669		2109.14	96499.3		5914.91	5914.91	272.971	82.9111
20-004-TP2B-C		7029.16	83514.5	542.811		1276.3	78221		240.504	4256.06	273.602	135.273
20-004-TP3A-A		5485.82	58253.3	672.524			20362.2		235.032	592.067	181.653	94.781
20-004-TP3A-B	223.14 *	3594.84	44423.3	354.867 *		3873.8	119234		167.205 *	9257.47	115.671 *	89.6478
20-004-TP3B-B		5318.39	54739.8	472.979		2041.29	71018.9		162.408	4666.86	126.725	51.7819
20-004-TP3B-C	224.387 *	6405.8	153813	729.217		1917.09	29825.7		176.903	2128.33		356.228
20-004-TP-1-COMP	324.842 *	4978.82	183334	518.178 *		1872.37	24298.2		317.182	4613.13		317.601
20-004-TP-2-COMP		6978.88	96181.6	585.7		2759.42	62761.1	497.199 *	299.824	9310.58	112.859 *	144.728
20-004-TP-3B-A		5515 \$	74894 \$	487 \$		1533 \$	78336 \$	201 \$	426 \$	3557 \$	182 \$	137 \$
20-004-TP-3-COMP		6432.87	95235.6	589.046		1968.83	89967.4		271.471	5175.58	249.347	137.596
20-004-UNK1		18751.4	63703.9	1594.22		1675.55	30187.6		1995.05	12023.6		96.131
20-004-WR1-A		17373.9	55901.6	1468.24		592.542 *	30539		48.076 *	2254.1	90.7749 *	205.498
20-004-WR1-B		14808.8	80724.5	1423.63		2579.08	45841.4		233.126	5879.61		218.611
20-004-WR1-C		8399.76	168410	955.75		1832.76	15878.4		51.8993 *	2291.01		535.537
20-004-WR2-A		43223.2	14987.4	3439.83		862.311	16307		107.066 *	4453.43		27.7336
20-004-WR2-B	359.946 *	13218.4	111674	995.044		1579.59	22122.2		632.832	7290.06		237.195
20-004-WR3-A	506.96 *	7188.55	60948.7	858.099		3769.77	79166.4	373.32 *	1470.93	3786.99		156.861
20-004-WR3-B	404.842 *	11270.9	38251.7	1031.29		728.36 *	29004.9		1381.85	32858.8		106.197
20-004-WR3-C		13477.1	11412.7	2457.69		60285.8	160698		152.38	447.095		106.197
20-004-WR4-A		4271.02	44554.5	482.633			91641.3		228.481	1312.1	281.38	15.9896 *
20-004-WR4-B		4099.92	46199.2	411.23			91641.3		101.636 *	493.01	541.174	21.9503
20-004-WR-1-COMP		19359.5	93861.1	1126.79		1369.78	13938.6		121.325 *	3312.41		239.586
20-004-WR-3-COMP	407.543 *	13655.7	34524.6	872.892	167.923 *	1726.65	38659.8	507.047 *	727.34	5525.09		91.649
20-004-WR-4-COMP		8272.71	38486.6	174.503 *	324.7 *	2199.91	113220	1425.46	187.995	893.434	314.152	20.0714 *

XRF SAMPLE ID	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
20-004-SE-1000	155.412			208.102	75.727		58.2966 *	323.718	337.801 *	8.88789 *	10.8582 *
20-004-SE-250	205.584			370.556	109.885			579.268			6.34764 *
20-004-SE-500	135.18			119.238	68.283			328.3			
20-004-SE-750	126.281			46.4678	70.1054			394.053			
20-004-TP1A-A	36.4102		14.4347	2995.11	13.4631 *		86.6996 *	39.4436 *	529.556 *		
20-004-TP1A-B	34.0314		13.3262	5229.06	18.6537 *		146.596 *	52.9466 *	690.601 *		
20-004-TP1A-C	45.4869		12.2969	3769.45	11.6864 *		68.9979 *	51.4401 *	586.907 *		
20-004-TP1A-D	213.778			2683.74	93.2765		59.8588 *	501.63	388.112 *	15.3238 *	16.4439 *
20-004-TP1B-A	34.0748		5.14275 *	2672.06	12.2687 *			38.1649 *			
20-004-TP1B-B	30.9484		10.948 *	2546.63	13.5394 *			48.5999 *			
20-004-TP1B-C	43.2008		15.0308	3275.47	14.8127 *		103.732 *	47.2004 *	495.302 *		
20-004-TP1B-D	35.4572		3.9073 *	4321.86	18.7775 *		109.678 *	55.3546 *			
20-004-TP1B-E	50.1239		9.34519 *	3241.42	35.4072 *		119.61 *	87.7978	475.759 *		
20-004-TP1B-F	46.6146		8.42633 *	4867.76	27.183 *		161.389 *	38.7566 *	665.209 *		
20-004-TP2A-A	49.0875		13.5305	4735.05	18.3173 *		136.66 *	58.8211 *	696.283 *		
20-004-TP2A-B	19.2899			1116.49	29.6569 *			27.8871 *	599.989 *		6.80589 *
20-004-TP2A-C	47.3854		4.63534 *	955.324	38.9842		137.121 *	64.1925 *	804.15 *		
20-004-TP2B-A	70.4509			43.1885 *	43.1988		80.1294 *	100.935	530.237 *		
20-004-TP2B-B	34.3907		2.9223 *	131.872	21.8785 *			41.8489 *	487.35 *		
20-004-TP2B-C	47.0474		6.05105 *	170.791	30.1784 *			90.4251	622.81 *		5.16657 *
20-004-TP3A-A	41.5555		8.43874 *	321.28	34.4187			56.6798			9.71021 *
20-004-TP3A-B	48.4144			93.5952	25.5607 *			21.3582 *			
20-004-TP3B-B	52.006			75.0532	25.5311 *			64.9324	712.367 *		
20-004-TP3B-C	46.3599		8.28301 *	2320.37	17.4395 *			52.9705 *	550.253 *		
20-004-TP-1-COMP	47.827		11.9887	3582.65	14.5794 *			66.3699	607.438 *		
20-004-TP-2-COMP	32.6796	49.926 *	3.85614 *	924.21	29.4905 *			41.0089 *	553.912 *		14.1704 *
20-004-TP-3B-A	46 \$		155 \$		30 \$		29 \$	58 \$	547 \$		
20-004-TP-3-COMP	41.6355		5.38946 *	482.019	21.1724 *			42.5831 *	532.792 *		
20-004-UNK1	105.541		23.0596	1097.9	64.1309			130.631	815.696 *		
20-004-WR1-A	102.998		3.89165 *	309.352	67.4883			352.437	418.918 *		7.4771 *
20-004-WR1-B	87.5667		3.95437 *	1241.7	58.2856			209.527	420.394 *		
20-004-WR1-C	57.5713		10.7573	1072.94	33.8149			176.741			7.22887 *
20-004-WR2-A	170.836			1806.08	137.642			554.687	472.364 *	9.48093 *	
20-004-WR2-B	61.7315		6.58325 *	3754.53	54.3295 *			132.915	477.486 *		
20-004-WR3-A	89.8556			37690.2	47.6285 *			47.3092 *	1455.92 *		10.9999 *
20-004-WR3-B	92.5737			8926.06	63.4362			178.171	476.81 *		
20-004-WR3-C	172.837			2293.51	79.358			395.215		8.64389 *	8.83789 *
20-004-WR4-A	55.3435			163.794	30.045 *			51.5313 *			
20-004-WR4-B	56.6089		4.22381 *	258.099	31.2805 *			82.6743			
20-004-WR-1-COMP	79.2635		4.19138 *	1446.26	60.4501			209.274			180.49
20-004-WR-3-COMP	59.0268	182.7	25.7973	10932.1	129.341			216.737	770.435 *		
20-004-WR-4-COMP	44.3378			204.13	34.3658 *			80.9803	362.505 *		

* - Estimated Quantity

\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

FOREST ROSE
PA NO. 20-004

AIMSS SCORESHEET

SITE NAME:

FOREST ROSE

PA NUMBER:

20-004

LINE NO.			PA NUMBER:	20-04
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	126.340
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		21
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	21.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	1061256
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	139.913
16		DRINKING WATER POP'N		0
17	SW - TARGETS	IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	18
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	2014747
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		20
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	8.552
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	10
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	8552
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	7.763
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	2
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	2329
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			
	(LINES 10 + 24 + 35 + 44) / 100,000			30.87

LINE NO.	SITE SAFETY			SCORE
	THREAT	ACCESSIBILITY		
1				20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	300
5		HAZ. STRUCTURES	40 EA.	480
6		EXPLOSIVES		0
7		HAZ. MATERIALS		100
8		HAZARDS SCORE	SUM LINES 2 - 7	930
9	TARGETS	POPULATION - 1 MILE		0
10		NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	2
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	37.20

SITE NAME:

FOREST ROSE

PA NUMBER:

20-004

**SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES**

LAB ID	SAMPLE ID	Cr	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
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OHIO MINE

DISSOLVED METALS: (ppb)

92Q1165	JOHS10L	-1.24	U	0.14	U		6.01	B		27.99			-0.57	U		-1.01	U	
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TOTAL RECOVERABLE METALS: (ppb)

92Q1166	JOHS10L	0.00	U	0.00	U		0.00	U		6.02	B		1.42	B		0.00	U	
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FOREST ROSE MINE

DISSOLVED METALS: (ppb)

92Q1055	DFRS10L	-1.62	U	0.60	U		-0.55	U		25.86			-0.33	U		-1.15	U	
92Q1056	DFRS20L	-1.50	U	2.05	U		0.79	U		33.03			-0.37	U		-1.14	U	
92Q1057	DFRS30L	-1.66	U	1.12	U		-0.32	U		1.25	U		-0.07	U		-1.14	U	

WASA MINE

DISSOLVED METALS: (ppb)

92Q1058	DWSS10L	-1.61	U	10.57	B		12.21	B		175.64			-0.19	U		-1.15	U	
92Q1059	DWSS20L	-1.63	U	31.37	B		205.70			1353.93			4.12	B		-1.15	U	
92Q1060	DWSS30L	-1.41	U	5.56	B		0.50	U		630.10			0.52	U		-0.97	U	

TOTAL RECOVERABLE METALS: (ppb)

92Q1061	DWSS20L	0.00	U	28.57	B		395.77			1469.00			34.59			0.00	U	
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TOTAL METALS: (ppm)

92S1063	DWSD30H	13.01	B	59.73	B		1179.95		*	2365.55	N*		263.70	*		0.00	U	*
92S1064	DWSD20H	12.99	B	59.13	B		2565.33		*	5929.72	N*		345.70	*		0.00	U	*
92S1065	DWSD10H	2.08	B	3.34	B		4535.49		*	512.14	N*		424.19	*		0.00	U	*

BANNER MINE

Two surface water samples collected at site in 1993. Results not available yet.

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
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OHIO MINE

DISSOLVED METALS: (ppb)

92Q1165	JOHS10L	-0.59	U		59.63	B		-0.70	U				
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TOTAL RECOVERABLE METALS: (ppb)

92Q1166	JOHS10L	0.00	U		60.72	B		0.00	U		0.12	B	
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FOREST ROSE MINE

DISSOLVED METALS: (ppb)

92Q1055	DFRS10L	-0.73	U		7.88	B		-1.10	U				
92Q1056	DFRS20L	-0.47	U		16.18	B		-0.81	U				
92Q1057	DFRS30L	-0.90	U		28.57	B		-1.07	U				

WASA MINE

DISSOLVED METALS: (ppb)

92Q1058	DWSS10L	1.10	U		23.11	B		-0.90	U				
92Q1059	DWSS20L	21.39			0.77	U		-1.03	U				
92Q1060	DWSS30L	4.20	B		7.98	B		-0.81	U				

TOTAL RECOVERABLE METALS: (ppb)

92Q1061	DWSS20L	20.54			0.00	U		2.37	B		0.13	B	
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TOTAL METALS: (ppm)

92S1063	DWSD30H	33.79			67.38	B	N*	83.05			1.23		
92S1064	DWSD20H	81.56			48.09	B	N*	53.45			1.57		
92S1065	DWSD10H	15.50			19.02	B	N*	45.34			2.43		

BANNER MINE

Two surface water sample

U.S.F.S./M.B.M.G. DATA

Ver. 2.0
by J. M. M.

SAMPLING AND ANALYSIS PLAN
FOREST ROSE MINE SITE, DEERLODGE CO.
09N07W22DBC
6220' ASLD

The Forest Rose Mine Site is located south of Jens on Dunkleberg Creek. The mine site consists of adit, mill, and tailing ponds. The site trends north-parallel to Dunkleberg Creek. The south half of the site is on private property. The site consists mostly of three terraces of tailings that partially fill Dunkleberg Creek valley. At the southern portion of the site on private property, water seeps from what may be a caved adit at a rate of about 5 gpm, but sinks into the ground shortly not far from where it emerges.

A small, shallow pond on the most northern terrace of tailing is fed water by a seep south of the pond and north of the road. This seep is probably not the result of mining activities, but rather naturally occurring. Water does not flow from the pond, but infiltrates into the tailings.

Seeps emerge along the toe of the most northern terrace of tailings. The flow is concentrated into one channel about 200 feet downstream from the toe of this terrace. The flow rate is about 30 gpm.

Samples of the seeps along the toe of the terrace of tailings, and the seep feeding the pond will be collected. Also, a sample of Dunkleberg Creek upstream from the site will be collected. Sampling and analysis will conform to the MBMG-USFS Quality Assurance Project Plan (QAPP) and the MBMG Standard Field Operating Procedures (SOP). The requested analysis for the sample is specified below.

DFRS101. Sample of Dunkleberg Creek south of the site will be collected. This sample will be used to establish background water quality. Bob Wintergerst of the USFS has sampled this site previously. Analysis will be for Dissolved Metal analytes specified in the MBMG-USFS Quality Assurance Project Plan (QAPP). Discharge will be measured with a dam-pipe-bucket and stopwatch.

DFRS20L Sample of seepage from along toe of terrace collected where seepage is concentrated into one discharge channel. Bob Wintergerst of the USFS has sampled this site previously. Analysis will be for Dissolved Metal analytes specified in the MBMG-USFS Quality Assurance Project Plan (QAPP). Discharge will be measured with a dam-pipe-bucket and stopwatch.

DFRS30L Sample of seepage that feeds pond on the north terrace. This sample will be used to establish background water quality. Analysis will be for Dissolved Metal analytes specified in the MBMG-USFS Quality Assurance Project Plan (QAPP). Discharge will be measured with a dam-pipe-bucket and stopwatch.

MONTANA BUREAU OF MINES AND GEOLOGY
 BUTTE, MONTANA 59701 (406)496-4101

WATER QUALITY ANALYSIS
 LAB NO.: 92Q1057

State: MT County: GRANITE
 Latitude-Longitude: D ' N D ' W Site Location: 09N 12W 22 DBD 01
 Topographic Map: MBMG Site: M:128822
 Geologic Source: Project Id: DLFORST
 Drainage Basin: PA Station Id:
 Agency + Sampler: MBMG*OEB Sample Source: MINE
 Bottle number: DFR530L Land Surface Altitude: 5240.0 FT.
 Date Sampled: 01 SEP 1992 Water Flow Rate: 0.2 GPM
 Time Sampled: 16:45 Flow Meas Method: VOLUMETRIC
 Lab + Analyst: MBMG*SPM Staff Gage:
 Date Complete: Stream Stage:
 Sample Handling: 3120 Depth to Sample:
 Method Sampled: GRAB Total Depth of Water:
 Procedure Type: Dissolved Stream Width:
 Water Use: RESEARCH

Sampling Site: FOREST ROSE MINE * SAMPLE 3
 Drainage Basin: CLARK FORK RIVER ABOVE BLACKFOOT RIVER

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	76.0	3.79	Bicarbonate (HCO ₃)	215.	3.52
Magnesium (Mg)	8.8	0.72	Carbonate (CO ₃)	0.	0.00
Sodium (Na)	2.2	0.10	Chloride (Cl)	.97	0.03
Potassium (K)	.3	0.01	Sulfate (SO ₄)	71.5	1.39
Iron (Fe)	<.003	0.00	Nitrate (as N)	.06	0.00
Manganese (Mn)	.019	0.00	Fluoride (F)	.2	0.01
Silica (SiO ₂)	9.4		OrthoPhosphate (as P)	<.05	0.00

Total Cations: 4.63 Total Anions: 5.06

Standard Deviation of Anion-Cation Balance (Sigma): 2.42

Calculated Dissolved Solid:	275.37	Total Hardness as CaCO ₃ :	225.99
Sum of Diss, Constituent:	384.46	Field Hardness as CaCO ₃ :	
Field conductivity, micromhos:	519.9	Total Alkalinity as CaCO ₃ :	176.34
Lab conductivity, micromhos:	475.	Field Alkalinity as CaCO ₃ :	
Field PH:	7.76	Ryznar Stability Index:	6.59
Laboratory PH:	8.16	Langlier Saturation Index:	0.79
		Sodium Adsorption Ratio:	0.06

Parameter	Value	Parameter	Value
Field Temp, Air		Field Temp, Water	13.2 C
REDOX POTENTIAL (MV)	-45.2		
ALUMINUM, DISS (UG/L-AL)	4.2	MOLYBDENUM, DISS (UG/L-MO)	<1.
ARSENIC, DISS (UG/L AS AS)	<1.	NICKEL, DISS (UG/L AS NI)	1.2
BARIUM, DISS (UG/L AS BA)	28.6	PHOSPHATE, TO, DIS (MG/L-P)	<.5
BROMIDE, DISS (UG/L AS BR)	<50.	SELENIUM, DISS (UG/L-SE)	<1.
CADMIUM, DISS (UG/L AS CD)	<1.	SILVER, DISS (UG/L AS AG)	<1.
CHROMIUM, DISS (UG/L-CR)	<1.	STRONTIUM, DISS (UG/L-SR)	322.
COPPER, DISS (UG/L AS CU)	<1.	TITANIUM DIS (UG/L AS TI)	<10.
LEAD, DISS (UG/L AS PB)	<1.	VANADIUM, DISS (UG/L AS V)	<1.
LITHIUM, DISS (UG/L AS LI)	<6.	ZINC, DISS (UG/L AS ZN)	1.3
MERCURY, DISS (UG/L AS HG)	<0.1	ZIRCONIUM DIS (UG/L - ZR)	<100.

Water condition:

1: CLEAR

Field remarks:

1: SEEP WEST AND ABOVE FOREST ROSE MINE ALONG ROAD

Explanation: mg/L = milligrams per liter, ug/L = micrograms per liter, meq/L milliequivalents per liter. FT = feet, Mt = meters, TR = total recoverable, TOT = total, BIO = biologically available. Sigma includes AL, CU, SR, ZN, and H+ if reported.

Printed: 26 MAY 93

Percent Meq/L (For Piper Plot)
 Ca Mg Na K Cl SO₄ HCO₃ CO₃
 82.1 15.7 2.1 0.2 0.5 29.5 69.9 0.0

NOTE: In correspondence, please refer to Lab Number: 92Q1057

State: MT	County: GRANITE
Latitude-Longitude: D ' N D ' W	Site Location: 09N 12W 22 DBD 01
Topographic Map:	MBMG Site: M128821
Geologic Source:	Project Id: DLFORST
Drainage Basin: PA	Station Id:
Agency + Sampler: MBMG+OEB	Sample Source: SPRING
Bottle number: DFRS20L	Land Surface Altitude:
Date Sampled: 01 SEP 1992	Sustained Yield:
Time Sampled: 15:45	Yield Meas Method:
Lab + Analyst: MBMG+SPM	Total Depth of Well:
Date Complete:	SWL above(-) or below GS:
Sample Handling: 3120	Casing Diameter:
Method Sampled: GRAB	Casing Type:
Procedure Type: Dissolved	Completion Type:
Water Use: RESEARCH	Perforation Interval:

Sampling Site: FOREST ROSE MINE * SAMPLE 2
Drainage Basin: CLARK FORK RIVER ABOVE BLACKFOOT RIVER

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	105.	5.24	Bicarbonate (HCO3)	241.	3.95
Magnesium (Mg)	11.9	0.98	Carbonate (CO3)	0.	0.00
Sodium (Na)	2.1	0.09	Chloride (Cl)	.6	0.02
Potassium (K)	1.1	0.03	Sulfate (SO4)	107.	2.23
Iron (Fe)	<.003	0.00	Nitrate (as N)	.14	0.01
Manganese (Mn)	.005	0.00	Fluoride (F)	.18	0.01
Silica (SiO2)	7.9		OrthoPhosphate (as P)	<.05	0.00

Total Cations: 6.35 Total Anions: 6.21

Standard Deviation of Anion-Cation Balance (Sigma): -0.67

Calculated Dissolved Solid:	354.64	Total Hardness as CaCO3:	311.17
Sum of Diss, Constituent:	476.93	Field Hardness as CaCO3:	
Field conductivity, micromhos:	726.2	Total Alkalinity as CaCO3:	197.66
Lab conductivity, micromhos:	613.	Field Alkalinity as CaCO3:	
Field PH:	7.35	Ryznar Stability Index:	6.61
Laboratory PH:	7.76	Langlier Saturation Index:	0.58
		Sodium Adsorption Ratio:	0.05

Parameter	Value	Parameter	Value
Field Temp, Air		Field Temp, Water	6.9 C
REDOX POTENTIAL (MV)	-20.6		
ALUMINUM, DISS (UG/L-AL)	1.9	MOLYBDENUM, DISS (UG/L-MO)	<1.
ARSENIC, DISS (UG/L AS AS)	<1.	NICKEL, DISS (UG/L AS NI)	2.1
BARIUM, DISS (UG/L AS BA)	16.2	PHOSPHATE, TO, DIS (MG/L-P)	<.5
BROMIDE, DISS (UG/L AS BR)	<50.	SELENIUM, DISS (UG/L-SE)	<1.
CADMIUM, DISS (UG/L AS CD)	<1.	SILVER, DISS (UG/L AS AG)	<1.
CHROMIUM, DISS (UG/L-CR)	<1.	STRONTIUM, DISS (UG/L-SR)	340.
COPPER, DISS (UG/L AS CU)	<1.	TITANIUM DIS (UG/L AS TI)	<10.
LEAD, DISS (UG/L AS PB)	<1.	VANADIUM, DISS (UG/L AS V)	<1.
LITHIUM, DISS (UG/L AS LI)	<6.	ZINC, DISS (UG/L AS ZN)	1.3
MERCURY, DISS (UG/L AS HG)	0.1	ZIRCONIUM DIS (UG/L - ZR)	<100.

Water condition:
1: CLEAR

Field remarks:
1: SEEP AT MOST DOWNSTREAM SETTLING POND

Explanation: mg/L = milligrams per liter, ug/L = micrograms per liter, meq/L milliequivalents per liter. FT = feet, Mt = meters, TR = total recoverable, TOT = total, BIO = biologically available. Sigma includes AL, CU, SR, ZN, and H+ if reported.

Printed: 26 MAY 93

Percent Meq/L (For Piper Plot)							
Ca	Mg	Na	K	Cl	SO4	HCO3	CO3
82.7	15.4	1.4	0.4	0.3	36.0	63.8	0.0

NOTE: In correspondence, please refer to Lab Number: 92Q1056

FOREST SERVICE DATA

PURPOSE

The purpose of monitoring Dunkleberg Creek is to determine the effects on the watershed as a result of past mining activities at the Forest Rose Mine.

STUDY SITE LOCATION

The Dunkleberg Study Area consists of two (2) monitoring stations. One station is located above the Forest Rose Mining Area (NE 1/4 of Section 27, Township 9 N., Range 12 W.). The second station is located below the last settling pond below the mine (SE 1/4 of Section 22, Township 9 N., Range 12 W.). Both stations are in the upper section of the Dunkleberg Drainage.

Sampling at each site consists of a standard water sample (composed of a 500 ml water sample that has been filtered and stabilized with 5 ml of nitric acid and a 500 ml water sample that has been filtered as well as a 500 ml raw water sample), a suspended water sample (composed of a 500 ml water sample stabilized with 5 ml of nitric acid), and a stream substrate grab sample (bedload equivalent).

Each sampling technique is designed to analyze various particle sizes with in the stream system (See Sampling Technique Diagram).

INITIAL OBSERVATIONS FROM WATER SAMPLING

The results from the water sampling shows little to no difference in water quality between the two stations, with the exception of a higher Sulfate value at the station below the mine area. The amounts of heavy metals at both stations appears to be small or below the detection limits of the analytical technique.

INITIAL OBSERVATIONS FROM THE SUSPENDED SAMPLING

The results from the suspended sampling are similar to those results seen by the water sampling.

A possible explanation for the lack of nondiscrepancy between the two stations and the low metal values in such an altered drainage may be due to the fact that the samples were taken during the driest portion of the year (August 30th) with little to no leach occurring through the mine tails. Should the sampling occur during spring run off a different set of results may occur.

INITIAL OBSERVATION FROM SUBSTRATE (BEDLOAD) SAMPLING

The results from the substrate sampling shows high amounts of Barium, Iron, Manganese, Copper, Lead Titanium, and Zinc.

Also noted is the fact that in the case of Iron, Manganese, Molybdenum, Nickel, Chromium, Copper, Lead, Lithium, and Zinc the values from the samples taken above the mine are higher than the values seen from the sample taken from the station below the mine

At first it was thought that the samples had been switched, but a quick check the documentation showed that no switching of the samples occurred.

This being the case it might be implied that there is a build up of material behind the settling ponds. This fact is of concern because if the last settling pond is breached due to snow melt or run off from a major storm event (common in the area) there may be a large movement on undesirable material down the drainage.

CONCLUSIONS

It is felt that the monitoring program at the Forest Rose mine in the Dunkleberg drainage should continue with samples being gathered during peak run off.

In addition efforts should be made by the U. S. Forest Service and the Abandoned Mines Division of the Montana Department of State Lands to stabilize or reclaim the mine site.

SAMPLING TECHNIQUES

PARTICLE
SIZE

PARTICLE
TYPE

SAMPLING
TECHNIQUE

WATER

SUSPENDED

LOGARITHMIC DIAMETER IN MM.

10^8

10^7

10^6

10^5

10^4

10^3

10^2

10^1

1

10

10^2

10^3

CLAY

SILT

SAND

PEBBLES

COBBLES



BEDLOAD



MONTANA BUREAU OF MINES AND GEOLOGY
BUTTE, MONTANA 59701 (406)496-4101

WATER QUALITY ANALYSIS
LAB NO.: 90Q0321

State: MT County: GRANITE
Latitude-Longitude: 46D31'06"N 113D05'03"W Site Location: 09N 12W 22 DABC 01
Topographic Map: DUNKLEBERG CREEK 7 1/2' MBMG Site: M:120925
Geologic Source: Project Id:
Drainage Basin: PA Station Id: 463104113050401
Agency + Sampler: USFS*BW Sample Source: STREAM
Bottle number: Land Surface Altitude: 5160.0 FT.
Date Sampled: 30 AUG 1990 Water Flow Rat 0.1 CFS
Time Sampled: 09:45 Flow Meas Method: CURRENT METER
Lab + Analyst: MBMG*SSH Staff Gage:
Date Analyzed: 27 DEC 1990 Stream Stage: LOW FLOW
Sample Handling: Depth to Sample: 0.10 FT. rept.
Method Sampled: GRAB Total Depth of Water: 0.10 FT.
Procedure Type: Biol. Available Stream Width: 1 FT.
Water Use: UNUSED

Sampling Site: DUNKLEBERG CREEK * BELOW FOREST ROSE MINE
Drainage Basin: CLARK FORK RIVER ABOVE BLACKFOOT RIVER

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	120.	5.99	Bicarbonate (HCO3)		0.00
Magnesium (Mg)	13.1	1.08	Carbonate (CO3)		0.00
Sodium (Na)	2.10	0.09	Chloride (Cl)		0.00
Potassium (K)	1.22	0.03	Sulfate (SO4)		0.00
Iron (Fe)	.080	0.00	Nitrate (as N)		0.00
Manganese (Mn)	.015	0.00	Fluoride (F)		0.00
Silica (SiO2)	9.2		OrthoPhosphate (as P)		0.00
Total Cations:		7.22	Total Anions:		0.00

Standard Deviation of Anion-Cation Balance (Sigma):

Calculated Dissolved Solid:		Total Hardness as CaCO3:	353.56
Sum of Diss. Constituent:		Field Hardness as CaCO3:	
Field conductivity, micromhos:	799.	Total Alkalinity as CaCO3:	
Lab conductivity, micromhos:		Field Alkalinity as CaCO3:	
Field PH:	9.5	Ryznar Stability Index:	
Laboratory PH:		Langlier Saturation Index:	
		Sodium Adsorption Ratio:	0.05

Parameter	Value	Parameter	Value
Field Temp, Air	13.0 C	Field Temp, Water	7.5 C
ALUMINUM, BIO. (UG/L-AL)	128.	NICKEL, BIO. (UG/L AS NI)	<20.
BARIUM, BIO. (UG/L AS BA)	14.	PHOSPHORUS, TOTAL (MG/L-P)	.2
BORON, BIO. (UG/L AS B)	<40.	SILVER, BIO. (UG/L AS AG)	<4.
CADMIUM, BIO. (UG/L AS CD)	<5.	STRONTIUM, BIO. (UG/L-SR)	358.
CHROMIUM, BIO. (UG/L-CR)	<5.	TITANIUM BIO (UG/L AS TI)	20.
COPPER, BIO. (UG/L AS CU)	<4.	VANADIUM, BIO. (UG/L AS V)	<4.
LITHIUM, BIO. (UG/L AS LI)	<4.	ZINC, BIO. (UG/L AS ZN)	38.
MOLYBDENUM, BIO. (UG/L-MO)	<40.	ZIRCONIUM BIO (UG/L - ZR)	<6.

Field remarks:

1: SUSPENDED SAMPLE FOR DUNKLEBERG CREEK BELOW FOREST ROSE MINE *

Explanation: mg/L = milligrams per liter, ug/L = micrograms per liter, meq/L milliequivalents per liter. FT = feet, Mt = meters, TR = total recoverable, TOT = total, BIO = biologically available. Sigma includes AL, CU, SR, ZN, and H+ if reported.

Printed: 07 JAN 91

Percent Meq/L (For Piper Plot)
Ca Mg Na K Cl SO4 HCO3 CO3
83.3 15.0 1.3 0.4

NOTE: In correspondence, please refer to Lab Number: 90Q0321

MONTANA BUREAU OF MINES AND GEOLOGY
BUTTE, MONTANA 59701 (406)496-4101

WATER QUALITY ANALYSIS
LAB NO.: 90Q0319

State: MT
Latitude-Longitude: 46D31'06"N 113D05'03"W
Topographic Map: DUNKLEBERG CREEK 7 1/2'
Geologic Source:
Drainage Basin: PA
Agency + Sampler: USFS*BW
Bottle number:
Date Sampled: 03 AUG 1990
Time Sampled: 19:45
Lab. + Analyte: MBMG*SSH
Date completed: 03 JAN 1991
Sample Handling:
Method Sampled: GRAB
Procedure Type: Dissolved
Water Use: UNUSED

County: GRANITE
Site Location: 09N 12W 22 DABC 01
MBMG Site: M:120925
Project Id:
Station Id: 463106113050301
Sample Source: STREAM
Land Surface Altitude: 5160.0 FT.
Water Flow Rat: 0.1 CFS
Flow Meas Method: CURRENT METER
Staff Gage:
Stream Stage: LOW FLOW
Depth to Sample: 0.10 Rept.
Total Depth of Water: 0.10 FT
Stream Width: 1 FT

Sampling Site: DUNKLEBERG CREEK * BLW FOREST ROSE MINE
Drainage Basin: CLARK FORK RIVER ABOVE BLACKFOOT RIVER

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	115.	5.74	Bicarbonate (HCO3)	168.	2.75
Magnesium (Mg)	12.7	1.04	Carbonate (CO3)		0.00
Sodium (Na)	2.15	0.09	Chloride (Cl)	2.	0.06
Potassium (K)	1.26	0.03	Sulfate (SO4)	161.	3.35
Iron (Fe)	<.004	0.00	Nitrate (as N)	.22	0.02
Manganese (Mn)	.003	0.00	Fluoride (F)	.14	0.01
Silica (SiO2)	8.91		OrthoPhosphate (as P)	<.1	0.00

Total Cations: 6.93 Total Anions: 6.19

Standard Deviation of Anion-Cation Balance (Sigma): -3.71

Calculated Dissolved Solid:	386.14	Total Hardness as CaCO3:	339.43
Sum of Diss, Constituent:	471.38	Field Hardness as CaCO3:	
Field conductivity, micromhos:	530.	Total Alkalinity as CaCO3:	137.79
Lab conductivity, micromhos:	560.3	Field Alkalinity as CaCO3:	
Field PH:	9.5	Ryznar Stability Index:	6.95
Laboratory PH:	7.65	Langlier Saturation Index:	0.35
		Sodium Adsorption Ratio:	0.05

Parameter	Value	Parameter	Value
Field Temp, Air	13.0 C	Field Temp, Water	7.5 C

ALUMINUM, DISS (UG/L-AL)	134.	MOLYBDENUM, DISS (UG/L-MO)	<40.
BARIUM, DISS (UG/L AS BA)	23.	NICKEL, DISS (UG/L AS NI)	<20.
BORON, DISS (UG/L AS B)	<40.	PHOSPHATE, TO, DISS (MG/L-P)	.1
BROMIDE, DISS (UG/L AS BR)	<100.	SILVER, DISS (UG/L AS AG)	<4.
CADMIUM, DISS (UG/L AS CD)	<5.	STRONTIUM, DISS (UG/L-SR)	348.
CHROMIUM, DISS (UG/L-CR)	<5.	TITANIUM DISS (UG/L AS TI)	21.
COPPER, DISS (UG/L AS CU)	<4.	VANADIUM, DISS (UG/L AS V)	<4.
LITHIUM, DISS (UG/L AS LI)	<4.	ZINC, DISS (UG/L AS ZN)	39.
		ZIRCONIUM DISS (UG/L - ZR)	<6.

Field remarks:
1: WATER SAMPLE

Lab remarks:
1: Recheck shows BICARB ppt.; cannot correct imbalance.

Explanation: mg/L = milligrams per liter, ug/L = micrograms per liter, meq/L milliequivalents per liter. FT = feet, Mt = meters, TR = total recoverable, TOT = total, BIO = biologically available. Sigma includes AL, CU, SR, ZN, and H+ if reported.

Percent Meq/L (For Piper Plot)
Ca Mg Na K Cl SO4 HCO3 CO3
83.1 15.1 1.4 0.5 0.9 54.4 44.7 0.0

Printed: 28 JAN 91

NOTE: In correspondence, please refer to Lab Number: 90Q0319



MONTANA BUREAU OF MINES AND GEOLOGY
MONTANA COLLEGE OF MINERAL SCIENCE AND TECHNOLOGY
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(406) 496-4180

Analytical Division
Scott S. Hughes, Chief
(406) 496-4279

U.S. Forest Service
Attn: Tim Sullivan
c/o Butte RD
1820 Meadowlark
Butte, MT 59701

REPORT OF ANALYSES

February 12, 1991

Dunkleberg Creek Above and Below Forest Rose Mine.

Lab# G121 = Above FRM

Lab# G122 = Below FRM

All values in ppm

Samples	Ca	Mg	Na	K	Fe	Mn
G121	38942	6419	2549	12400	42200	4598
G122	13909	9161	2812	15200	32100	928

Samples	Al	B	Ba	Cd	Cr	Cu	Li	Mo
G121	58694	85	483	<2	46	157	31	25
G122	53345	113	519	<2	44	51	24	21

Samples	Ni	P	Pb	Sr	Ti	V	Zn	Zr
G121	41	1170	1150	165	278	89	2125	20
G122	34	990	110	94	695	93	1214	30

Authorized Signature: _____

Scott S. Hughes

Date: 2-12-91

taken at the Forest Rose.

Element	Sample	Disolved	Total Rec	Primary	Secondary	Aqu_Acute	Aqu_Chron
Cu	DFRS40L	0.00500	0.02611		1.00	0.018	0.012
	DFRS50L	0.02403	0.05107		1.00	0.018	0.012
Zn	DFRS40L	0.00218	0.14330		5.00	0.120	0.110
	DFRS50L	0.00397	0.27800		5.00	0.120	0.110
As	DFRS40L	0.00198	0.00428	0.05		0.360	0.190
	DFRS50L	0.00210	0.00257	0.05		0.360	0.190
Se	DFRS40L	0.00130	1.17000			0.018	0.012
	DFRS50L	0.00119	0.00150			0.018	0.012
Mo	DFRS40L	0.00217	0.00210			0.018	0.012
	DFRS50L	0.00265	0.00227			0.018	0.012
Ag	DFRS40L	0.00018	0.00029		0.10	0.004	0.0001
	DFRS50L	0.00015	0.00021		0.10	0.004	0.0001
Cd	DFRS40L	0.00061	0.00196	0.005		0.004	0.001
	DFRS50L	0.00062	0.00186	0.005		0.004	0.001
Ba	DFRS40L	0.00940	0.03642	2.00			
	DFRS50L	0.00885	0.01297	2.00			
Pb	DFRS40L	0.00076	0.01873	0.015		0.00	0.003
	DFRS50L	0.00206	0.01426	0.015		0.00	0.003
Mn	DFRS40L	0.00076	0.01873	0.015		0.00	0.003
	DFRS50L	0.00206	0.01426	0.015		0.00	0.003

SAMPLE DFRS40L TAKEN BELOW SLIDE ON
6/4/93

SAMPLE DFRS50L TAKEN FROM TAILINGS POND
ON 6/8/93

Sample	Cu	Zn	As	Se	Hg
DFRD30H	118.25	2048.02	249.60	5.84	2.12
DFRD20L	21.45	199.79	11.88	0.52	0.36
DFRD10L	42.50	652.04	42.70	1.43	1.58

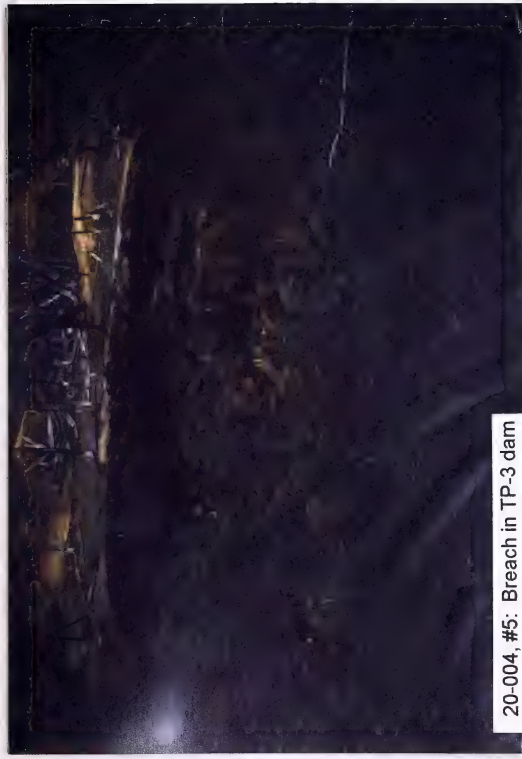
Sample	Ag	Cd	Ka	Pb
DFRD30H	3.73	15.77	17.53	136.71
DFRD20L	0.73	2.34	37.09	69.76
DFRD10L	1.60	6.10	27.66	397.93



20-004, #1: SW-1 sample location



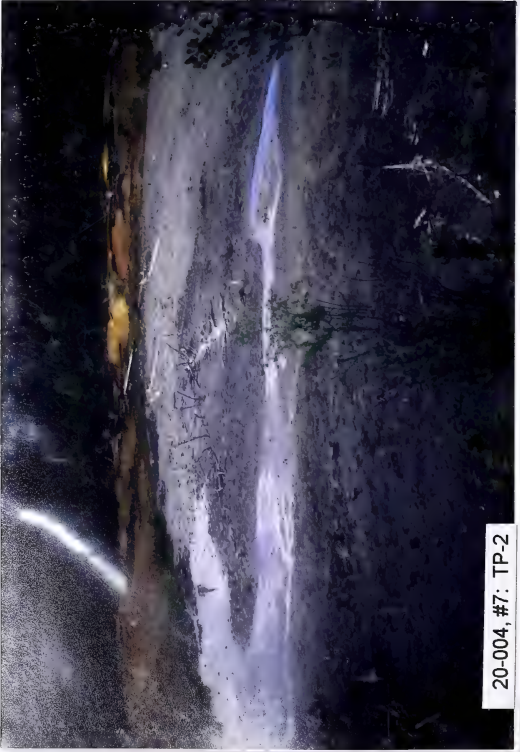
20-004, #2: SW-2 sample location



20-004, #5: Breach in TP-3 dam



20-004, #6: TP-3



20-004, #7: TP-2



20-004, #8: TP-1 erosion gully



20-004, #9: Mill building (hazardous)



20-004, #23: WR-4, facing west



20-004, #24: WR-2, facing southwest



20-004, #25: WR-1 and SW-2 sample location



20-004, #26: GW-1 sample location

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: WASA PA#: 20-023

Date: June 29, 1993 Time: 1000

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: Earl McCurley, MDSL
Tim Pfahler, MDSL Helicopter Pilot

Weather/Seasonality Observations: Partly cloudy; warm (55-60°F);
breezy (10-15 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #2: Adit discharge
at WR-2; #3-#5: WR-3; #6: WR-7 with North Fork Douglas Creek; #7:
Adit discharge at GW-2; #8: Standing water at GW-1; #9: Pit.
Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Very
dangerous highwall for pit with elevated metals levels (Cd and Sb).
Waste rock could be reprocessed. Adit discharges should be
treated.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): WASA PA#: 20-023

Legal Description: T 9N ; R 12W ; Sec. 27 , SW 1/4 SW 1/4 1/4

County: GRANITE Mining District: DUNKLEBURG

Latitude: N 46° 29' 53" Longitude: W 113° 05' 38"

Primary Drainage Basin and Code: Douglas Creek/17010202

Secondary Drainage Basin: North Fork Douglas Creek

USGS Quadrangle map name(s): Pikes Peak

Mine Type/Commodities: Hardrock/Zinc, Gold, Silver, Lead, Copper

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): M.A. Kaverman,
E. 1085 23rd Ave., Spokane, WA 99206; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Ore to
Forest Rose Mill

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 6200' , Slope 35° ,
Aspect North

Land use: Mining , Recreational X , Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? 2 acres.
Dimensions:

Predominant vegetation types: Pine

Access: roads - good X , poor , 4wd , trail .
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MEMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). The site lies in the headwaters of the
North Fork Douglas Creek, which flows north away from the site.
Site is underlain by intensely deformed cretaceous limestone.

Mining/milling history, ore type/tenor, host rock, gangue: Mine
was discovered in 1910 and worked almost continuously until 1947.
Ore type is hydrothermal replacement in limestone of cretaceous
age. Major ore minerals were sphalerite and galena with minor
amounts of chalcopyrite, galena, pyrrhotite and siderite.

Mine Operation?

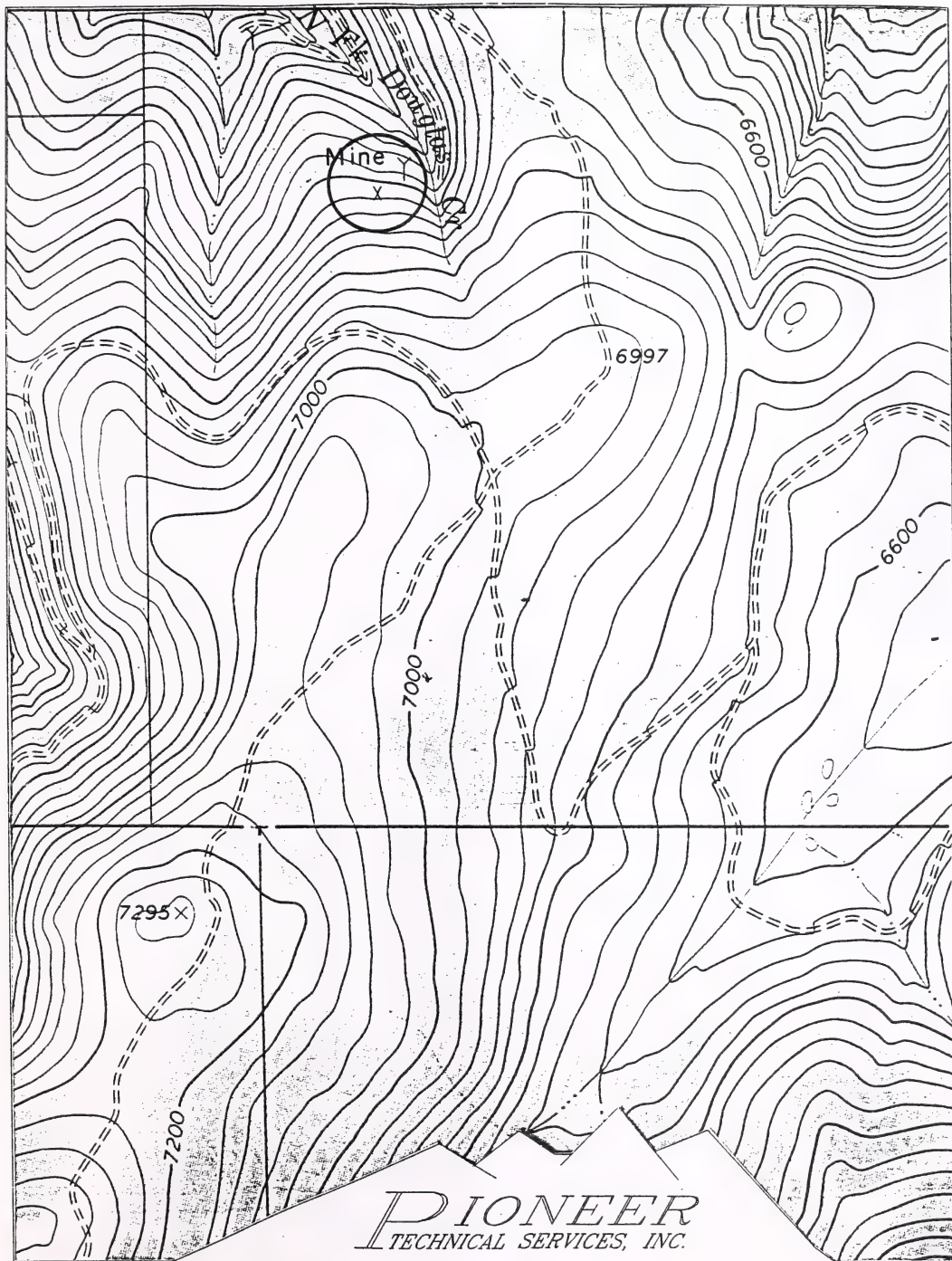
Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 3, Comment 2 caved
Pits - Yes X, No , # 1, Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes , No X. If yes answer the next three
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A



PIONEER
TECHNICAL SERVICES, INC.

WASA, P.A. NO. 20-023

T09N, R12W, SECTION 27

SCALE: 1" = 1000'

- LEGEND**
- | | | | |
|--|-----------------------------|--|---------------------|
| | OPEN ADIT | | CULVERT |
| | COLLAPSED ADIT | | LIGHT (LIGHT POLE) |
| | OPEN SHAFT | | UTILITY POLE |
| | COLLAPSED SHAFT | | CENTERLINE MONUMENT |
| | EXCAVATION | | DECIDUOUS TREE |
| | WHITE ROCK DUMP | | CONIFEROUS TREE |
| | COLLAPSED TIMBERS | | WOOD FENCE |
| | PILE | | WIRE FENCE |
| | DUMP | | BUILDING |
| | SOIL SAMPLE | | BARRIER POST |
| | XRF SAMPLE | | GATE |
| | WATER SAMPLE | | EDGE OF ASPHALT |
| | GROUND AND SURFACE DRAINAGE | | EDGE OF GRAVEL |
| | WATER WELL | | SLOPE DIRECTION |
| | | | WHITE ROCK |



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
WASA 20-023
DUNKLEBERG DISTRICT GRANITE COUNTY

PIONEER
TD&H

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
MONTANA
WASHINGTON

DRAWN: MHC DATE: 8/93
DESIGNED: TCR JOB NO. 93-17
APPROVED: F.B. NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAIN- MENT	pH SU (D/S)	RADIO- ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	3,650	Above highwall; west side off toe	None	6.0 (D)	0.04	20-023-WR-1	06/29/93 2010	T-Metals, ABA
WR-2	WR	800	East of North Fork Douglas Creek; south side near top	None	6.8 (D)	0.04	20-023-WR-2	06/29/93 2015	T-Metals, ABA
WR-3	WR	1,825	Furthest south; east side on top	None	6.4 (D)	0.05			
WR-4	WR	350	Adjacent to pit (highwall); east side off knob	None	6.6 (D)	0.04	20-023-WR-3	06/29/93 2020	T-Metals, ABA
WR-5	WR	2,250	Below highwall pit; south lobe on top	None	5.3 (D)	0.05	20-023-WR-4	06/29/93 2025	T-Metals, ABA
WR-6	WR	730	Above adit discharge; east side, east of loadout	None	5.9 (D)	0.06			
WR-7A	WR	4,400	Furthest north; southwest end on side	None	6.8 (D)	0.04	20-023-WR-5	06/29/93 2030	T-Metals, ABA
WR-7B	WR		Furthest north; north end on top, north of wood track	None	5.4 (D)	0.04			

D: Direct reading (Kilg/ Meter); S: Subtotal; P: Total (Gross Meter)

Comments or deviations from SOPs: 20-023-WR-1 is composite of WR-1 and WR-3. 20-023-WR-2 is WR-2. 20-023-WR-3 is WR-4. 20-023-WR-4 is composite of WR-5 and WR-6. 20-023-WR-5 is composite of WR-7A and -7B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No , Number: 2 Identification: At WR-2 and WR-6

Filled shafts: Yes X, No , Number: 1 Identification: A filled pit, not a shaft

Seeps/Springs: Yes X, No , Number: 1 Identification: Seeps throughout dumps

Groundwater wells within 4 miles?: Yes X, No ;

Number of well logs: 8

Distance to nearest well used for drinking? > 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable X, Possible , Unlikely .

Uncontained sources and groundwater visible in pit with elevated metals.

Other observations/notes: N/A

SAMPLERS: Babits, Pierson, Lasher

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map of topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): North Fork Douglas Creek

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes X, No , Name(s)/Description: Seeps

Waste materials within any floodplain: Yes X, No Source ID(s): Dump in North Fork Douglas Creek

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 15 gpm
High Flow: 50 gpm, Average Flow: 10 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; waste rock in North Fork Douglas Creek

Surface water draining onto or through waste sources: Yes X, No ,
Describe: North Fork Douglas Creek flows through WR-7.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes
No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Downgradient surface water is iron-stained.

SAMPLERS: Babits, Pierson, Lasher

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres

Wetlands present: Yes , No X, Describe:

Carbonate rocks/soils: Yes X, No , Describe: Limestone is present.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 X;
100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 1 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
 observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/POOR)
WR-1	SO3	Partial	27,000	27,000	Yes	Low
WR-2	SO3	Partial	3,150	3,150	Yes	Low
WR-3	SO3	Partial	26,100	26,100	Yes	Low
WR-4	SO3	Partial	1,620	1,620	Yes	Low
WR-5	SO3	Partial	8,100	8,100	Yes	Low
WR-6	SO3	Partial	2,025	2,025	Yes	Low
WR-7	SO3	Partial	27,000	27,000	Yes	Low
SW	SPG	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe:

Population within 1 mile: 1-10 X; 10-30 ; 30-100 ; 100-300 ;
300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ;
Comments

Evidence of recreational use on site: Yes ☐ , No ☒ , Describe:

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No X, Comment_____

Wilderness Area - Yes___, No X, Comment_____

T&E Species Habitat - Yes X, No___, Comment Bald Eagle

Bat Habitat - Yes___, No X, Comment_____

Primary Drainage X ; Secondary Drainage ; No Information :

Riparian Habitat Quality - High___, Medium X, Low___
Wetlands Frontage - High___, Medium X, Low___
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No , Number 1, types and locations:
Adit at WR-6

Hazardous structures: Yes , No X , Number , types and locations:

Unstable highwalls, pits, trenches, slopes: Yes X, No , Number ,
types and locations: Highwall at pit

Unstable waste piles, impoundments, undercut banks: Yes X, No ,
Number 6 , types and locations: All piles are sloughing.

Fire and/or Explosion hazards: Yes , No X , Explain:

Bibliography

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- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Wasa, Prepared by Dick Juntunen, August 26, 1981.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Wasa, Prepared by Northern Engineering and Testing, July 1, 1987.
- Northern Testing Laboratories, Report of Geotechnical Investigation, Hard Rock Mine Dump and Mill Pond Project, Western Montana, November 1982.
- Pardee, J.T., The Dunkleburg Mining District, Granite County, Montana, Date Unknown, pp. 241-249.
- USGS, Topographic Map, Pikes Peak, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

WASA
PA NO. 20-023

SOLID MATRIX ANALYSES

Results per dry weight basis

Metals in soils

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-023-SE-1	166	95.9	5.7	67.9	9.2	973	21600	0.028 J	1960	35	72	4 J	308	NR
20-023-SE-2	77	67.4	54.4	78.8	7.9	833	39100	0.058 J	3860	110	94	15 J	8720	NR
20-023-WR-1	81	113	19.2	16.3	8.5	588	35700	0.066 J	1490	28	86	11 J	4010	NR
20-023-WR-2	102	40.7	1.3	0.5 U	6.2	72	20900	0.452 J	45.7	3	293	14 J	67	NR
20-023-WR-3	53	88.9	25.3	29	8.8	736	55400	0.038 J	1460	52	88	12 J	5670	NR
20-023-WR-4	108	25.8	0.4 U	4.6	8.2	408	98500	0.328 J	210	5	44	4 J	382	NR
20-023-WR-5	60	29.6	10	4.8	1.7	116	46300	0.386 J	664	21	72	4 J	1790	NR
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. U/1000	TOTAL SULFUR %	NEUTRAL POTENT. U/1000	SULFUR ACID BASE POTENT. U/1000	CO	CR	CU	FE	HG	MN	NI	PB	SB	ZN	CYANIDE
20-023-WR-1	0.03	0.94	6.86	5.93	<0.01	0.06	0.06	0.06	0.06	0.038 U	309	169	1.77	18.3 U	4540	32.2
20-023-WR-2	0.63	19.7	0.79	-18.	0.41	0.14	2.5	-1.71	0.038 U	93.2	51.4	22.5	0.7	26.7	3160	289
20-023-WR-3	0.06	1.87	7.91	6.04	0.02	0.04	0	7.91	0.038 U	125	51.4	22.5	0.7	26.7	1770	74.5
20-023-WR-4	2.25	70.3	-3.0	-73.	2.09	0.11	1.56	-4.64	0.038 U	55.7	120	43.9	2.63	18.3 U	89.5	17.2
20-023-WR-5	1.59	49.7	58.3	8.66	0.85	0.28	14.4	44	0.044	112	193	120	1.47	28.4	5250	274

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

WATER MATRIX ANALYSES

Results in ug/L

Metals in Water

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-023-GW-1	28.9	11	208 J	69.6 JX	5 U	3330	11500	0.038 U	309	169	1.77	18.3 U	4540	32.2
20-023-GW-2	1.38	6.33	19.1 J	5.99 U	5 U	10.5	303	0.038 U	93.2	29.4	1.41	20	3160	289
20-023-GW-3	0.98 U	9.73	26 J	6.7 JX	6.93	19.4	125	0.038 U	51.4	22.5	0.7	26.7	1770	74.5
20-023-SW-1	6.19	20.1	257 J	5.99 U	5 U	17.4	55.7	0.038 U	120	43.9	2.63	18.3 U	89.5	17.2
20-023-SW-2	2.89	8.2	51.7 J	7.77 JX	6.5	95.9	112	0.044	193	120	1.47	28.4	5250	274

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-023-GW-1	260	< 5.0	179	0.06	NR
20-023-GW-2	400	< 5.0	187	0.19	NR
20-023-GW-3	139	< 5.0	52	NR	NR
20-023-SW-1	58	< 5.0	13	< 0.05	NR
20-023-SW-2	409	< 5.0	178	< 0.05	NR

LEGEND

SE1 - Upgradient in North Fork Douglas Creek.
SE2 - Downgradient in North Fork Douglas Creek.
WR1 - Composite of subsamples WR1 and 3.
WR2 - Sample of subsample WR2.
WR3 - Sample of subsample WR4.
WR4 - Composite of subsamples WR5 and 6.
WR5 - Composite of subsamples WR7A and 7B.
BACKGROUND - From Jackson Park Mine (20-027-SS-1).

GW1 - Adit discharge at waste rock dump 2. Discharge goes to N. Fork Douglas Creek.
GW2 - Adit discharge at waste rock dump 6.
GW3 - From pit.
SW1 - Same as subsample SE1.
SW2 - Same as subsample SE2.

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

XRF ANALYSIS RESULTS

**WASA
PA NO. 20-023**

XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHf	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-023-WR4-A		30815.9	6136.09	2159.23		3929.24	87126.3		814.476	7813.12	100.103 *	106.14
20-023-WR4-A-DUP		30673.9	6044.11	2124.42		3751.82	86449.1		862.78	7802.06	77.5115 *	105.107
20-023-WR7-A		13089.9	24036.6	1008.51	176.654 *	3889.08	44353.3		125931 *	4357.19	79.0776 *	177.727
20-023-WR7-B		18356.8	24105.4	1142.74	171.662 *		77688.9		54.6059 *	168.967	54.6059 *	45.2961
20-023-WR7-B-DUP		19173.1	24746	1174.44	149.718 *		78013.9		164.721	164.721	66.9018 *	42.9617
20-023-WR-1		25428.7	7793.15	2666.48		3047.55	57661		627.39	6282.21	116.661 *	89.6721
20-023-WR-1-COMP		23691.2	7128.18	2616.25		2539.08	56244.8		551.26	5176.78	99.9984 *	100.689
20-023-WR-2		34330.3	2216.34	1972.69			42396.1		64.0388 *	271.287	140.987 *	87.3201
20-023-WR-3		25362	6764.27	2434.76		2559.4	42660		508.884	3948.57	123.256 *	83.9501
20-023-WR-4-COMP		10007	21498.5	1290.36			119760		428.736	673.554	166.592	47.8042
20-023-WR-5		12725.5	6260.49	1998.45	143.943 *	885.576 *	129368		578.073	1216.13	453.141	47.0015
20-023-WR-5-COMP		16550.2	16778.6	1170.12	153.948 *	442.71 *	73078.6		71.812 *	834.985	76.6553 *	83.5288
20-023-WR-6		8504.26	28827.3	1247.01	140.711 *		121645		202.338 *	293.464	57.3129 *	43.5934
Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th		
20-023-WR4-A	141.335	8.035 *	72.1226 *	177.975			1155.7	171.228 *		11.215		
20-023-WR4-A-DUP	152.702	6.77018 *	97.7881 *	179.263			1181.31	166.977 *		12.3825		
20-023-WR7-A	137.241		133.386	101.989			523.064			8.52513		
20-023-WR7-B	98.142	16.5269 *		140.628			461.07	118.399 *				
20-023-WR7-B-DUP	108.326	16.5453 *		144.914			443.957	85.2047 *		5.79387		
20-023-WR-1	184.979		47.4458 *	138.637			838.702	117.777 *		12.2062		
20-023-WR-1-COMP	228.709	44.0209 *	56.4536 *	141.956	170.261 *		897.753	118.364 *		19.9327		
20-023-WR-2	129.699		535.402	215.451			652.375	93.2692 *		37.6441		
20-023-WR-3	268.301		60.6534 *	165.999	184.701 *		854.152	118.448 *		16.9638		
20-023-WR-4-COMP	121.054	11.5455 *		92.2799			325.218			7.092		
20-023-WR-5	123.593	7.89155 *	65.8604 *	121.07			363.812		100.99 *	8.32713		
20-023-WR-5-COMP	114.672	14.2412 *	43.0849 *	133.511			489.318			7.71155		
20-023-WR-6	106.804	17.07 *		85.8529			312.088					

* - Estimated Quantity

\$ - Unvalidated Data

**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**WASA
PA NO. 20-023**

AIMSS SCORESHEET

SITE NAME:

WASA

PA NUMBER:

20-023

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.353
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		8
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	8.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	4330
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.734
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19	SW - TARGETS	FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	13
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	18034
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.052
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	45
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	117
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.038
40	DIRECT CONTACT	POPULATION - 1 MILE		1
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	1
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	4
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			0.22
	(LINES 10 + 24 + 35 + 44) / 100,000			

LINE
NO.

SITE NAME:
PA NUMBER:

WASA
20-023

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	125
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	1
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	2.50

**SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES**

LAB ID	SAMPLE ID	Cr	Crc	Crq	NI	Nlc	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
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OHIO MINE

DISSOLVED METALS: (ppb)

92Q1165	JOHS10L	-1.24	U	0.14	U	6.01	B	27.99	-0.57	U	-1.01	U							
---------	---------	-------	---	------	---	------	---	-------	-------	---	-------	---	--	--	--	--	--	--	--

TOTAL RECOVERABLE METALS: (ppb)

92Q1166	JOHS10L	0.00	U	0.00	U	0.00	U	6.02	1.42	B	0.00	U							
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FOREST ROSE MINE

DISSOLVED METALS: (ppb)

92Q1055	DFRS10L	-1.62	U	0.60	U	-0.55	U	25.86	-0.33	U	-1.15	U							
92Q1056	DFRS20L	-1.50	U	2.05	U	0.79	U	33.03	-0.37	U	-1.14	U							
92Q1057	DFRS30L	-1.66	U	1.12	U	-0.32	U	1.25	-0.07	U	-1.14	U							

WASA MINE

DISSOLVED METALS: (ppb)

92Q1058	DWSS10L	-1.61	U	10.57	B	12.21	B	175.64	-0.19	U	-1.15	U							
92Q1059	DWSS20L	-1.63	U	31.37	B	205.70		1353.93	4.12	B	-1.15	U							
92Q1060	DWSS30L	-1.41	U	5.56	B	0.50	U	630.10	0.52	U	-0.97	U							

TOTAL RECOVERABLE METALS: (ppb)

92Q1061	DWSS20L	0.00	U	28.57	B	395.77		1469.00	34.59		0.00	U							
---------	---------	------	---	-------	---	--------	--	---------	-------	--	------	---	--	--	--	--	--	--	--

TOTAL METALS: (ppm)

92S1063	DWSD10H	12.99	B	59.73	B	1179.95		2365.55	345.70		0.00	U							
92S1064	DWSD20H	12.99	B	59.13	B	2565.33		5929.72	345.70		0.00	U							
92S1065	DWSD10H	2.08	B	3.34	B	4535.49		512.14	424.19		0.00	U							

BANNER MINE

Two surface water samples collected at site in 1993. Results not available yet.

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
--------	-----------	----	-----	-----	----	-----	-----	----	-----	-----	----	-----	-----

OHIO MINE

DISSOLVED METALS: (ppb)

92Q1165	JOHS10L	-0.59	U	59.63	B	-0.70	U						
---------	---------	-------	---	-------	---	-------	---	--	--	--	--	--	--

TOTAL RECOVERABLE METALS: (ppb)

92Q1166	JOHS10L	0.00	U	60.72	B	0.00	U	0.12	B				
---------	---------	------	---	-------	---	------	---	------	---	--	--	--	--

FOREST ROSE MINE

DISSOLVED METALS: (ppb)

92Q1055	DFRS10L	-0.73	U	7.88	B	-1.10	U						
92Q1056	DFRS20L	-0.47	U	16.18	B	-0.81	U						
92Q1057	DFRS30L	-0.90	U	28.57	B	-1.07	U						

WASA MINE

DISSOLVED METALS: (ppb)

92Q1058	DWSS10L	1.10	U	23.11	B	-0.90	U						
92Q1059	DWSS20L	21.39	U	0.77	U	-1.03	U						
92Q1060	DWSS30L	4.20	B	7.98	B	-0.81	U						

TOTAL RECOVERABLE METALS: (ppb)

92Q1061	DWSS20L	20.54		0.00	U	2.37	B	0.13	B				
---------	---------	-------	--	------	---	------	---	------	---	--	--	--	--

TOTAL METALS: (ppm)

92S1063	DWSD30H	33.79		67.38	B	N*		83.05			1.23		
92S1064	DWSD20H	81.56		48.09	B	N*		53.45			1.57		
92S1065	DWSD10H	15.50		19.02	B	N*		45.34			2.43		

BANNER MINE

Two surface water sample



20-023, #3: WR-3



20-023, #5: WR-3



20-023, #2: Adit discharge at WR-2



20-023, #4: WR-3



20-023, #7: Adit at WR-6; GW-2 sample location



20-023, #9: Pit with headwall



20-023, #6: WR-7 with the North Fork of Douglas Creek



20-023, #8: Discharge; GW-1 sample location

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: JACKSON PARK PA#: 20-027

Date: July 1, 1993 Time: 0900

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: Unidentified Forest Service Personnel

Weather/Seasonality Observations: Partly cloudy; warm (55°F);
slight breeze; cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #16: WR-2; #17: WR-
3; #18: WR-4. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: All adits are
caved and all waste rock is small. Easy to recontour and
revegetate remaining waste rock dumps.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): JACKSON PARK PA#: 20-027

Legal Description: T 9N ; R 12W ; Sec. 13 , SW 1/4 SW 1/4 1/4

County: GRANITE Mining District: DUNKLEBURG

Latitude: N 46° 31' 50" Longitude: W 113° 03' 23"

Primary Drainage Basin and Code: Dunkleburg Creek/17010202

Secondary Drainage Basin: Unnamed Tributary to Dunkleburg Creek

USGS Quadrangle map name(s): Dunkleburg Creek

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public
Owner, Agent, or Contact (include address and phone when available): Ronald Wolfe,
Jackson Park Ranches, Rt. 2 Box 3400, Red Lodge, MT 59068. (406)
446-2611; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Numerous
mines in area.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? Permit unknown; WR-1 has been
reclaimed by filling in pit contouring and revegetation.

General site features: Elevation 5600' , Slope 25° ,
Aspect West

Land use: Mining , Recreational X , Residential , Urban ,
Agricultural X , Other (Specify)

Area of disturbed/unvegetated lands? < 1 acres.
Dimensions:

Predominant vegetation types: Thick grass, scattered pine trees

Access: roads - good X , poor , 4wd , trail .
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Site is located approx. 1,000 feet north
of an unnamed tributary to Dunkleburg Creek. The creek is approx.
1 mile west of the site. The site is underlain by granite bedrock.

Mining/milling history, ore type/tenor, host rock, gangue: No
information available.

Mine Operation?

Shafts - Yes X, No , # 1, Comment Reclaimed

Adits - Yes X, No , # 12, Comment All caved

Pits - Yes , No X, # , Comment

Placers - Yes , No X, # , Comment

Other - Yes , No X, # , Comment

Mill Operation? Yes , No X. If yes answer the next three
questions:

Period(s) of Operation: N/A

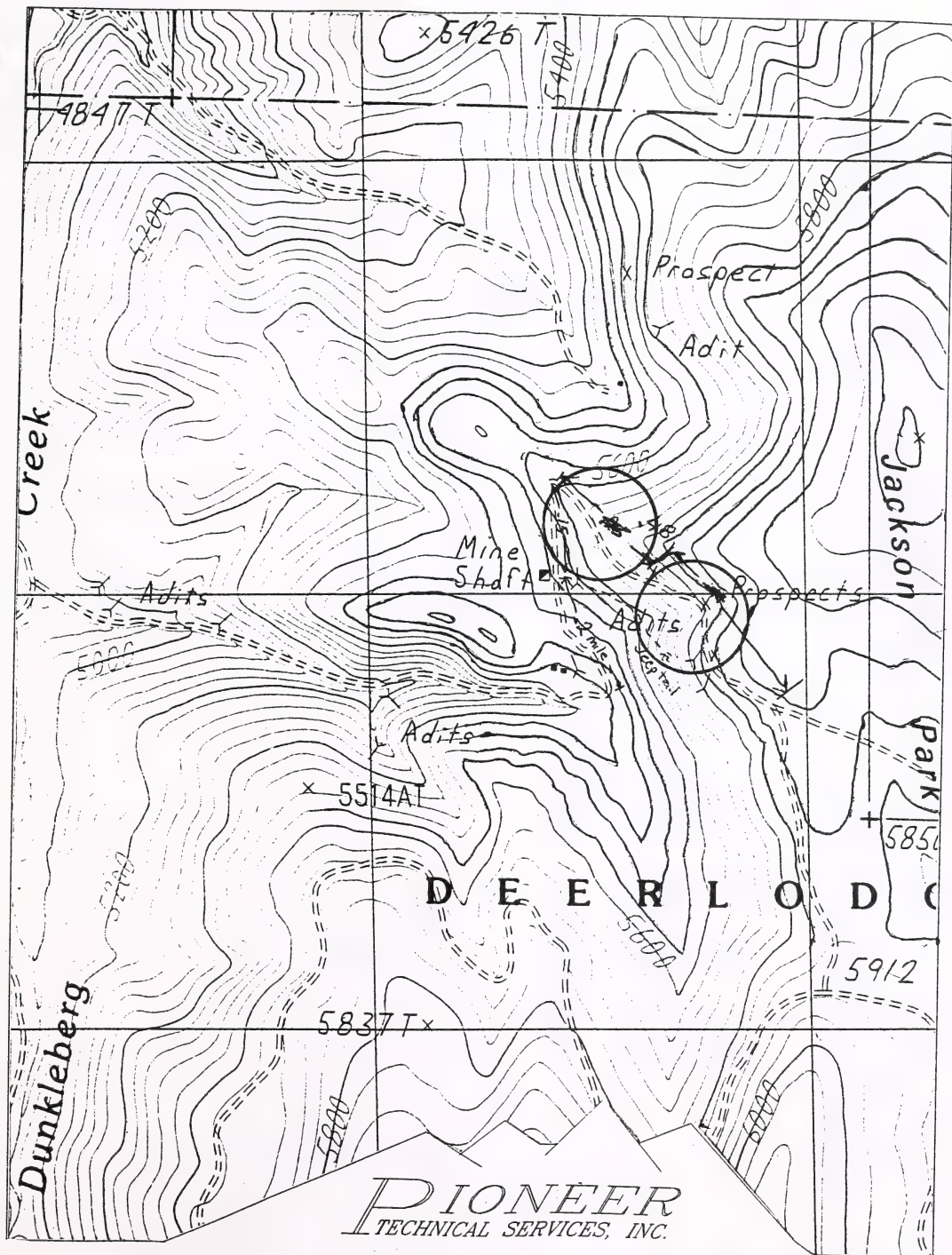
Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

10/15/1993

Well No.	Location	Depth	Yield	Static Water Level
M:59363	09N 12W 13	113.0	12.0	20.00



JACKSON PARK, P.A. NO. 20-027

T09N, R12W, SECTION 13

SCALE: 1" = 1000'

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): _____
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): _____
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): _____
N/A

Comments on potential for mitigation: _____
N/A

SAMPLERS: Babits, Pierson, Lasher

[illegible]

D-Direct reading (Kilowatt Meter); S-Saturated Vanite (Orion Meter)

Comments or deviations from SOPs: 20-027-WR-1 is composite of WR-1, -2, and -3. 20-027-WR-2 is a grab of WR-4.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:_____

Filled shafts: Yes___, No X, Number:___ Identification:_____

Seeps/Springs: Yes___, No X, Number:___ Identification:_____

Groundwater wells within 4 miles?: Yes X, No___;

Number of well logs: 23

Distance to nearest well used for drinking? 1/2 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___, Possible___, Unlikely X.

Uncontained source, but no expression of surface groundwater. Metals in dumps are only slightly elevated above background.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X, Name(s):_____

Dry streambeds: Yes____, No X, Name(s):_____

Other surface water: Yes____, No X, Name(s)/Description:_____

Waste materials within any floodplain: Yes____, No X Source ID(s):_____

Approximate Flood frequency?____1 yr,____10 yr,____100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow:_____, Average Flow:_____

Distance between waste source(s) and nearest surface water body (ft)?
Approx. 0.25 mile to unnamed tributary

Surface water draining onto or through waste sources: Yes____, No X,
Describe:_____

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, wetland, fishery

Observed erosional/sedimentation/stream turbidity problems? Yes____,
No X, Distance downstream (ft)?_____ Describe/explain (Note streambank
stability and condition of streambank vegetation and any manmade structures or channel changes present):_____

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? N/A

Wetlands present: Yes , No X, Describe:

Carbonate rocks/soils: Yes , No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 X;
100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 1/2 mile; FS cabin closer, but only
transient

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

SAMPLERS: Babits

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe: _____

Population within 1 mile: 1-10 X; 10-30____; 30-100____; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments _____

Evidence of recreational use on site: Yes X, No____, Describe: _____

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment _____
Wilderness Area -	Yes____, No <u>X</u> , Comment _____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment _____
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage____; Secondary Drainage____; No Information X:

Riparian Habitat Quality - High____, Medium____, Low____
Wetlands Frontage - High____, Medium____, Low____
Fisheries Habitat and Species Classification - ____
Sport Fishery Classification - ____

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes____, No X, Number____, types and locations: _____

Hazardous structures: Yes____, No X, Number____, types and locations: _____

Unstable highwalls, pits, trenches, slopes: Yes____, No X, Number____,
types and locations: _____

Unstable waste piles, impoundments, undercut banks: Yes____, No X,
Number____, types and locations: _____

Fire and/or Explosion hazards: Yes____, No X, Explain: _____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands Portal Inventory Form for Jackson Park, Prepared by Daphne Digirindakis, May 27, 1988.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Jackson Park, Prepared by Northern Engineering and Testing, August 29, 1987.

USGS, Topographic Map, Dunkleburg Creek, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

JACKSON PARK
PA NO. 20-027

SOLID MATRIX ANALYSES

Metals in soils

Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-027-WR-1	685 JX	152	18.3 J	29.2 J	139 J	856	44500 J	0.751	2230 J	122 J	2870 J	61 J	3080 J	NR
20-027-WR-2	1860 JX	101	17.4 J	31.5 J	125 J	902	49800 J	1.11	3890 J	104 J	8070 J	230 J	3250 J	NR
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
20-027-WR-1	0.31	9.68	73.9	64.2	0.3	0.01	<0.01	0	0	0	0.01	0	0	73.9
20-027-WR-2	<0.01	0	45.4	45.4	<0.01	0.01	<0.01	0	0	0	0.01	0	0	45.4

LEGEND

WR1 - Composite of subsamples WR1, 2, and 3.

WR2 - Sample of the subsample WR4.

BACKGROUND - From the Jackson Park Mine (20-027-SS-1).

XRF ANALYSIS RESULTS

**JACKSON PARK
PA NO. 20-027**

XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-027-SS-1		10228.2	15708	1512.8	216.763 *	1410.86	27345.4			148.765 *	52.8548 *	266.413
20-027-WR-1		13531	14219.3	2402.18	290.32 *	4629.4	62136.6		423.38	8327.57	229.747 *	271.776
20-027-WR-1-COMP		14826.9	26868.8	1943.11		5065.69	56479.2		648.394	3142.14	631.627	353.232
20-027-WR-2		12813.3	22350.1	1170.75		5591.01	57090.5		364.412	2565.79	1131.34	350.138
20-027-WR-3		11144.1	36006.1	1866.15		3747.16	54364.2		94.4797 *	1244.28	929.336	363.432
20-027-WR-4		11315.8	15304.1			6127.03	58213.7		698.193	3629.55	1012.11	140.275
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-027-SS-1	123.113				67.7737			403.896				
20-027-WR-1	78.6834			985.499	77.5816			372.626			10.7164	
20-027-WR-1-COMP	81.8949			2038.39	75.8924	144.113 *	121.544 *	388.884	104.994 *			
20-027-WR-2	100.74			1994.82	52.3914			460.142	112.828 *			
20-027-WR-3	88.8387			967.922	58.3849		144.225 *	385.656	113.791 *		9.0241	
20-027-WR-4	67.6107			5015.08	55.7411 *	157.265 *	464.47	227.13	185.625 *			

* - Estimated Quantity

\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

JACKSON PARK
PA NO. 20-027

AIMSS SCORESHEET

SITE NAME:

JACKSON PARK

PA NUMBER:

20-027

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	10
3C		POTENTIAL TO RELEASE	200
4		LIKELIHOOD SCORE	200
5	GW - WASTE CHAR.	CALCULATED SCORE	6.852
6		WELLS - 1 MI. x 2.5	2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI	22
8		NEAREST WELL	5
9		TARGETS SCORE	29.5
10		GROUNDWATER SCORE	40427
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12		EXCEEDENCES	0
13A	SW - LIKELIHOOD	CONTAINMENT	20
13B	OF RELEASE	DISTANCE TO SW	2
13C		POTENTIAL TO RELEASE	40
14		LIKELIHOOD SCORE	40
15	SW - WASTE CHAR.	CALCULATED SCORE	7.426
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	10
19	SW - TARGETS	FISHERY	0
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	17
24		SURFACE WATER SCORE	5050
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD	CONTAINMENT	10
26B	OF RELEASE	DISTANCE TO POPULATION	10
26C		POTENTIAL TO RELEASE	100
27		LIKELIHOOD SCORE	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	0.152
29		POPULATION - 4 MILES	30
30		NEAREST RESIDENCE	5
31	AIR - TARGETS	WETLANDS	0
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	35
35		AIR PATHWAY SCORE	532
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF	ACCESSIBILITY	20
37B	EXPOSURE	DISTANCE TO POPULATION	10
37C		POTENTIAL EXPOSURE	200
38		LIKELIHOOD SCORE	250
39	D. C. WASTE CHAR.	CALCULATED SCORE	0.141
40	DIRECT CONTACT	POPULATION - 1 MILE	1
41	TARGETS	NEAREST RESIDENCE	5
42		RECREATIONAL USE	5
43		TARGETS SCORE	11
44		DIRECT CONTACT SCORE	388
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		0.46
	(LINES 10 + 24 + 35 + 44) / 100,000		

LINE
NO.

SITE NAME:
PA NUMBER:

JACKSON PARK
20-027

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	8
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	11
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	0.00



20-027, #17: WR-3



20-027, #16: WR-2



20-027, #18: WR-4

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: MAXVILLE TAILINGS/LONDONDERRY PA#: 20-209

Date: September 9, 1993 Time: 0650

Field Team Leader: M. Babits, Pioneer

Sampling Personnel: S. Babits, Pioneer
Pierson, TD&H

Visitors: Mr. Jeff Snyder, landowner

Weather/Seasonality Observations: Cool to warm (50°-70°F);
mostly sunny; slight breeze (5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): Photos taken were
misplaced. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Tailings will
revegetate. Waste rock needs to be removed from Flint Creek; very
large and steep to revegetate. Adit drainage exceeds Maximum
Contaminant Levels for arsenic and cadmium and should be treated.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MAXVILLE TAILINGS/LONDONDERRY PA#: 20-209

Legal Description: T 8N ; R 13W ; Sec. 4 , SW1/4 NW1/4NW 1/4

County: GRANITE Mining District: MAXVILLE

Latitude: N 46° 28' 27" Longitude: W 113° 14' 33"

Primary Drainage Basin and Code: Flint Creek/17010202

Secondary Drainage Basin: Boulder Creek

USGS Quadrangle map name(s): Maxville

Mine Type/Commodities: Hardrock/Silver, Gold

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known YX ☒ N ☐ ; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): BLM; Deerlodge
County; Jeff Snyder, P.O. Box 334, Philipsburg, MT 59858; Fred
Metcalf, Philipsburg, MT.

Relationship to other mines/sites in the area/district: The
Nonpareil site is six miles upstream on Boulder Creek. The
Durand mine is 0.5 mile upstream on Flint Creek.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? This site is currently listed under
the CECRA Program.

General site features: Elevation 4800' , Slope 5°-35° ,
Aspect East

Land use: Mining ☐ , Recreational ☐ , Residential ☒ , Urban ☐ ,
Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 2.5 acres.

Dimensions:

Predominant vegetation types: Knapweed

Access: roads - good ☒ , poor ☐ , 4wd ☒ , trail ☐ .

Other logistical considerations (proximity to other sites). Road
to tailings on east bank; no road to waste rock on west bank.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 31 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Flint Creek flows south to north, dividing the site. Boulder Creek flows south to north on the east side of the site, joining Flint Creek just downstream of the site. Quartzite and shaly red sandstone of the Spokane Formation, and limestone underlies the site.

Mining/milling history, ore type/tenor, host rock, gangue: The site was discovered in 1915. In 1926, a 100-ton floatation mill was built, and in 1930 operations ceased. Ore is iron-stained sandstone which is silicified and carries silver and gold. By 1913, five rail cars shipped yielded an average of 1 oz. Au and 50 oz. Ag.

Mine Operation?

Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 2, Comment Both collapsed
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three questions:

Period(s) of Operation: 1926 to 1930

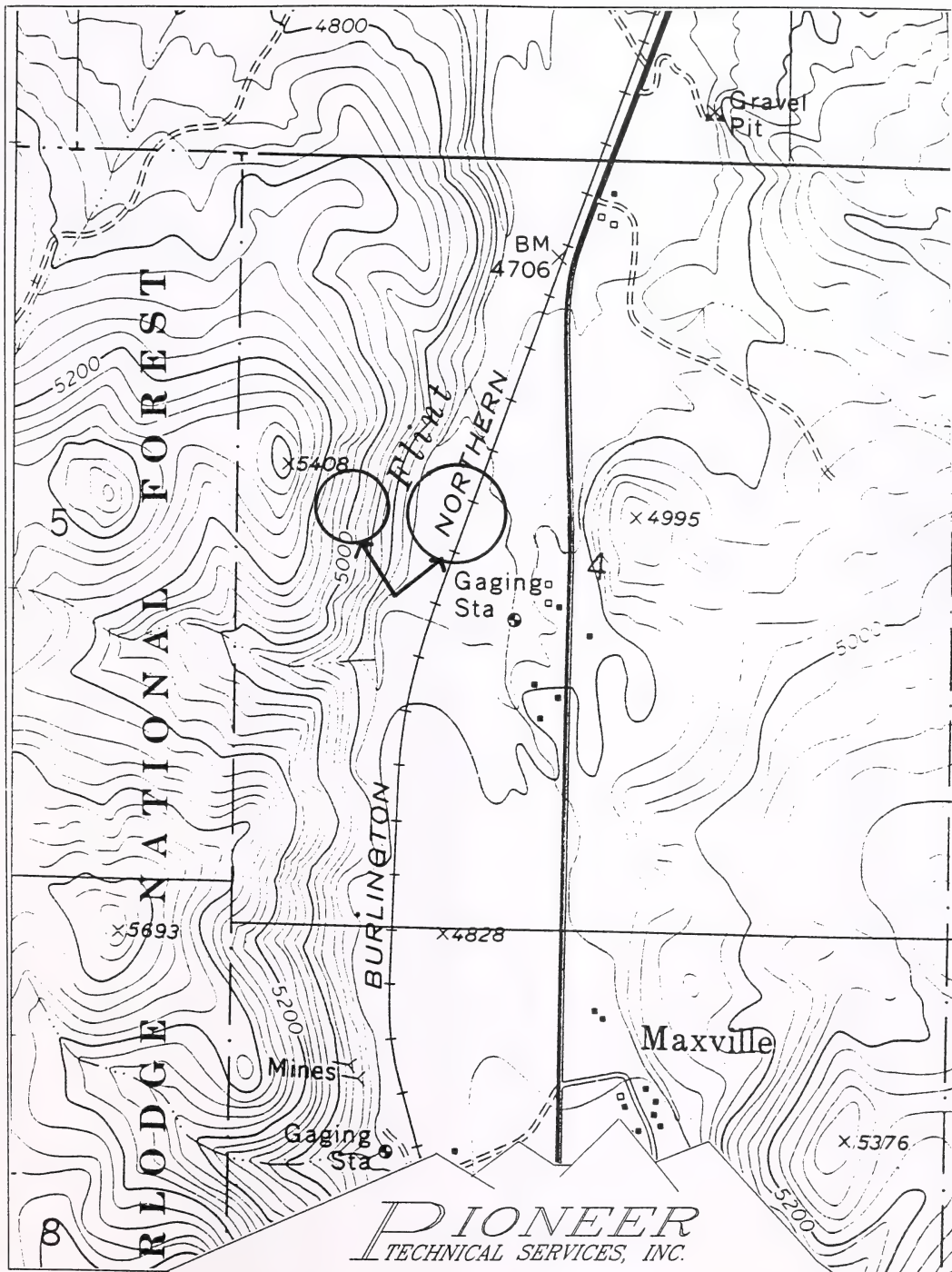
Origin of Ore Milled - Custom Mill Dedicated Mill X; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? Floatation

Montana Bureau of Mines and Geology
Water Well Log Data

10/15/1993

Well No.	Location	Depth	Yield	Static Water Level
M:57459	08N 13W 04	25.0	20.0	0.00
M:57458	08N 13W 04	35.0	16.0	16.00
M:57460	08N 13W 04 ABB	32.0	40.0	0.00
M:57461	08N 13W 04 ACB	29.0	40.0	0.00
M:57462	08N 13W 04 CAA	50.0	20.0	45.00
M:57463	08N 13W 04 CCD	36.0	15.0	26.00
M:57464	08N 13W 04 CDA	26.0	20.0	20.00
M:57465	08N 13W 04 DBB	35.0	5.0	30.00
M:57467	08N 13W 09	40.0	30.0	10.00
M:57466	08N 13W 09	40.0	30.0	15.00
M:123818	08N 13W 09 AA	40.0	20.0	20.00
M:57468	08N 13W 09 AC	35.0	10.0	14.00
M:57469	08N 13W 09 AC	35.0	10.0	14.00
M:57470	08N 13W 09 ACA	36.0	20.0	12.00
M:123819	08N 13W 09 BA	110.0	30.0	15.00
M:123820	08N 13W 09 BA	85.0	8.0	50.00
M:123821	08N 13W 09 BA	65.0	20.0	15.00
M:57471	08N 13W 09 BAC	35.0	5.0	30.00
M:130847	08N 13W 09 BB	60.0	30.0	18.00
M:57472	08N 13W 09 BBD	28.0	0.0	24.00
M:57473	08N 13W 09 BD	35.0	10.0	13.00
M:123822	08N 13W 09 CA	58.0	20.0	20.00
M:57474	08N 13W 09 CA	155.0	10.0	6.00
M:57475	08N 13W 09 CAD	16.0	20.0	11.00
M:57476	08N 13W 09 CDD	40.0	15.0	10.00
M:57477	08N 13W 09 D	37.0	30.0	21.00
M:57478	08N 13W 09 DD	40.0	15.0	25.00
M:57479	08N 13W 09 DDD	138.0	2.0	75.00
M:59390	09N 13W 33 CA	98.0	7.0	62.00
M:59391	09N 13W 33 DDC	52.0	10.0	30.00
M:59392	09N 13W 34 C	50.0	0.0	0.00

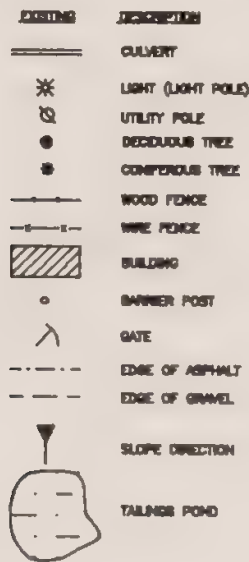
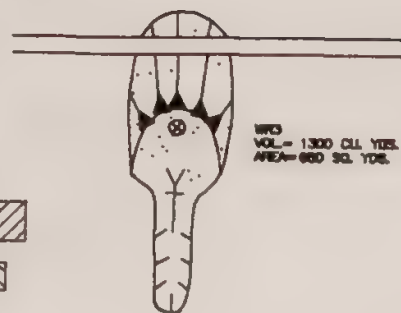


PIONEER
TECHNICAL SERVICES, INC.

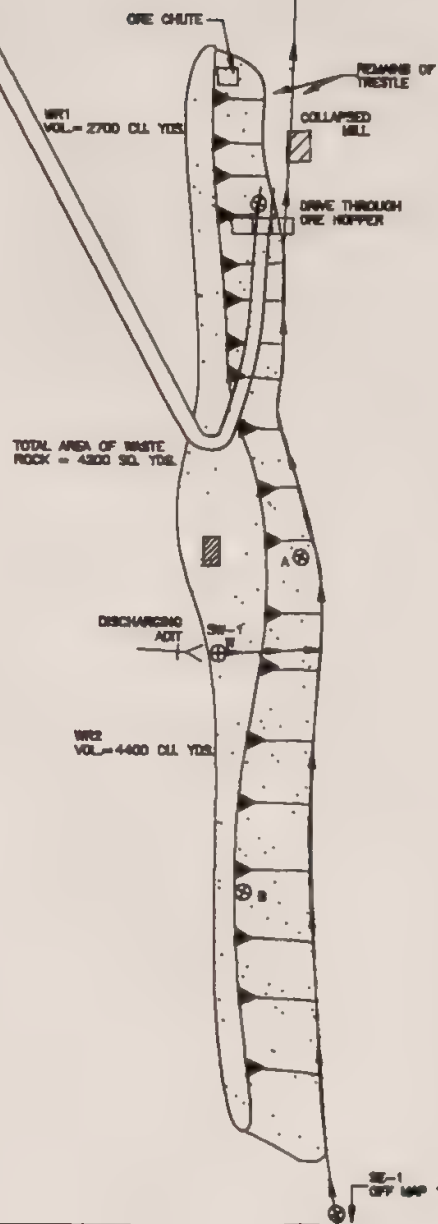
MAXVILLE TAILINGS, P.A. NO. 20-209

T08N, R13W, SECTION 04

SCALE: 1" = 1000'



LEGEND



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
MAXVILLE TAILINGS PA# 20-209
MAXVILLE DISTRICT GRANITE COUNTY

DRAWN JTP DATE 7 OCT 93
DESIGNED ITR JOB NO. 93-17
APPROVED WJB F.B. NO.

PIONEER
ENGINEERING AND CONSULTANTS

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS - BOZEMAN - KALISPELL
MONTANA
SPokane WASHINGTON

TDSH

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Clay to clay loam

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): TP-1 is 3' at deepest depth and TP-2 is 6' at deepest depth. Both average 1' depth.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Moist

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundments

Comments on potential for mitigation: Recontour and revegetate

SOURCE INVENTORY FORM

SAMPLERS: M. Babits, S. Babits

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
TP-1A-A	TAIL	250	NW corner of TP-1 by dam; 0'-2', clay	None	4.0 (D)	0.04	20-209-TP-1	09/09/93 1445	T-Metals, ABA
TP-1A-B	TAIL		NW corner of TP-1 by dam; 2'-3', clay	None	4.0 (D)	0.03			
TP-1A-C	TAIL		NW corner of TP-1 by dam; 3'-3.5'; underlying soil	None	5.0 (D)	0.04	20-209-TP-2	09/09/93 1450	T-Metals, ABA
TP-1B-A	TAIL		S edge of TP-1 near center; 0'-20", clay	None	5.2 (D)	0.03			
TP-1B-B	TAIL		S edge of TP-1 near center; 20"-24"; underlying soil	None	5.2 (D)	0.05			
TP-2A-A	TAIL	10,300	NW corner of TP-2 near center; 0'-3', clay loam	None	5.4 (D)	0.03			
TP-2A-B	TAIL		NW corner of TP-2 near center; 3'-6', clay loam	None	4.8 (D)	0.03			
WR-1	WR	2,700	S end near ore hopper	None	4.0 (D)	0.04	20-209-WR-1	09/09/93 1455	T-Metals, ABA
WR-2A	WR	4,400	N of seep	None	5.5 (D)	0.03			
WR-2B	WR		S of seep	None	6.8 (D)	0.03			
WR-3	WR	1,300	Upper workings	None	6.4 (D)	0.03	20-209-WR-2	09/09/93 1510	T-Metals, ABA

* Direct reading (Kulwy Meter); B-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 20-209-TP-1 is composite of TP-1A-A and -1A-B, TP-1B-A, and TP-2A-A and -2A-B. 20-209-TP-2 is composite of TP-1A-C and TP-1B-B. 20-209-WR-1 is composite of WR-1, WR-2A and -2B. 20-209-WR-2 is grab of WR-3.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No , Number: 1 Identification: At WR-2

Filled shafts: Yes , No X, Number: Identification:

Seeps/Springs: Yes , No X, Number: Identification:

Groundwater wells within 4 miles?: Yes X, No ;

Number of well logs: 46

Distance to nearest well used for drinking? 200 feet

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable , Possible X, Unlikely .

Uncontained source with shallow aquifer.

Other observations/notes: N/A

SAMPLERS: Babits

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Flint Creek and Boulder Creek

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): WR-1 and -2 in Flint Creek

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? Unknown; very large surface water body that is regulated by flow at dam of Georgetown Lake; a USGS gaging station is located nearby.

High Flow: 933 cfs, Average Flow: 97.8 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No , Describe: Adit discharge flows over WR-2.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, fishery, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes , No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): None observed during this investigation.

SAMPLERS: Babits

FLOW: Estimated (E) or Measured (M)?

MDSL AMRB/PIONEER 4/9/93

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 10 acres

Wetlands present: Yes X, No , Describe: Limited to streamside

Carbonate rocks/soils: Yes X, No , Describe: Limestone

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 X; 30-100 ;
100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 200 feet

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LEFT)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/NO OBSERVE/LOW/POSS)
TP-1	pH	Moist	4,500	2,250	Yes	Moderate
TP-2	pH	Moist	92,700	46,350	Yes	Moderate
WR-1	pH	Moist	37,800	37,800	Yes	Moderate to Low
WR-2	None	Moist	Included with WR-1	Included with WR-1	Yes	Moderate to Low
WR-3	None	Moist	5,850	5,850	Yes	Moderate to Low
SW-1	FE0X	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No ,
Describe: Snyder property

Population within 1 mile: 1-10 X; 10-30 ; 30-100 ; 100-300 ;
300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ;
Comments

Evidence of recreational use on site: Yes X, No , Describe:
Residential use on-site

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <u> </u> , No <u>X</u>	Comment <u> </u>
Wilderness Area -	Yes <u> </u> , No <u>X</u>	Comment <u> </u>
T&E Species Habitat -	Yes <u>X</u> , No <u> </u>	Comment <u>Bald Eagle</u>
Bat Habitat -	Yes <u> </u> , No <u>X</u>	Comment <u> </u>

Primary Drainage ; Secondary Drainage X; No Information :

Riparian Habitat Quality - High , Medium X, Low
Wetlands Frontage - High , Medium X, Low
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 3

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes , No X, Number , types and locations:

Hazardous structures: Yes X, No , Number 1, types and locations: Ore chute

Unstable highwalls, pits, trenches, slopes: Yes , No X, Number ,
types and locations:

Unstable waste piles, impoundments, undercut banks: Yes , No X,
Number , types and locations:

Fire and/or Explosion hazards: Yes X, No 3, Explain: Wood ore chute, collapsed bridge, and mill building

Bibliography

- BLM, Potential Hazardous Waste Site, Preliminary Assessment for the Maxville Tailings/Londonderry site, EPA Form 2070-12(7-81), October 29, 1990.
- CCJM, Draft Screening Site Inspection Report, Londonderry Mine Adit Site, February 28, 1990.
- CCJM, Final Screening Site Inspection Report, Londonderry Mine Adit Site, July 27, 1990.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Maxville Tailings/Londonderry site, Prepared for EPA CERCLIS (not inventoried).
- MDSL/AMRB Files, Memorandum from Vito A. Ciliberti, Jr., Soil and Water Scientist, Garnet, To Area Manager, Garnet, Regarding Leaking Adit Near Maxville, Montana, May 3, 1989.
- USGS, Certificate of Survey, To Create a Tract Over 20 Acres Located in the SW 1/4, Section 4, T. 8 N., R. 13 W., P.M.M., Granite County, Montana, Surveyed by William D. Bayer, May 1992.
- USGS, Topographic Map, Maxville, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

MAXVILLE TAILINGS/LONDONDERRY
PA NO. 20-209

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-209-SE-1	214	975 J	1.3	3.32 J	4.87	64.4 J	8310	0.591	5280 J	3.3 U	246	13.3 J	863	NR
20-209-SE-2	196	1030 J	1.5	3.19 J	3.03	61.9 J	6950	17.9	5270 J	2.6 U	217	16.5 J	795	NR
20-209-TP-1	4260	150 J	4.9	1.88 U	1.33 U	30 J	10500	0.45	245 J	2.46 U	523	151 J	898	NR
20-209-TP-2	1480	187 J	6.1	11.5 J	10.1	117 J	22900	0.284	697 J	11.6	190	20.7 J	708	NR
20-209-WR-1	1790	180 J	0.5	1.6 U	1.13 U	14.4 J	8000	0.41	847 J	2.09 U	760	124 J	151	NR
20-209-WR-2	1340	116 J	0.6	1.57 U	1.55	15.3 J	7240	0.826	9.4 J	2.1	1120	135 J	205	NR
BACKGROUND	76.3	329	1.6	6.18	6.06	116	11700	1.33 J	1530 J	6.77	85.8	33.3	47.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. u/1000	NEUTRAL POTENT. u/1000	SULFUR ACID BASE POTENT. u/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE POTENT. u/1000	SULFUR ACID BASE POTENT. u/1000
20-209-TP-1	0.42	13.1	2.19	-10.	0.31	0.09	0.02	2.81	-0.62
20-209-TP-2	0.69	21.6	36.5	14.9	0.69	<0.01	0.02	0	36.5
20-209-WR-1	0.08	2.5	0.28	-2.2	0.07	<0.01	0.01	0	0.28
20-209-WR1-DUF	0.07	2.19	0.15	-2.0	0.05	0.01	0.01	0.31	-0.16
20-209-WR-2	0.1	3.12	0.74	-2.3	0.08	0.01	0.01	0.31	0.43

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-209-SW-1	2350 JX	28.1	5.57	9.7 U	6.83 U	2	11600	0.12 U	1090	25.9	2.15	30.7 UJX	2630	251

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-209-SW-1	392	3.9	137	0.11	NR

LEGEND

SE1 - 150 feet upgradient from waste rock dump 2.
SE2 - 200 feet downgradient from waste rock dump 1.
TP1 - Composite of subsamples TPIA-A, 1A-B, 2A-A, and 2A-B.
TP2 - Composite of subsamples TPIA-C and 1B-B.
WR1 - Composite of subsamples WR1.2A, 2B, and 3.
WR2 - Sample of the WR3 sub-sample.
WR1-DUP - Duplicate of 20-209-WR-1.

BACKGROUND - From the Combination Mine.
(20-009-SS-1)
SW1 - Adit discharge at waste rock dump 2.

XRF ANALYSIS RESULTS

**MAXVILLE TAILINGS/LONDONDERRY
PA NO. 20-209**

XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-209-TP1A-A		27315.2	3791.81	1580.6		235.433 *	13154.6			231.753	5898.72	159.062
20-209-TP1A-B			5323.49	1780.23	200.276 *		17170.4			417.825	5778.74	153.515
20-209-TP1A-C			8578.83	1918.37	169.389 *	1280.81	32987.2		206.391	786.846	2558.05	188.178
20-209-TP1B-A			3897.85	1458.9	217.199 *		12514.8			62.545 *	5605.9	143.645
20-209-TP1B-B			8543.09	1639.31	177.913 *	1105.41	20097.3			493.004	208.499	211.881
20-209-TP2-A	39 \$	19604 \$	4380 \$	1299 \$	86 \$	402 \$	9283 \$	93 \$		1101 \$	3409 \$	53 \$
20-209-TP2-B			3980 \$	777 \$	160 \$	497 \$	8658 \$		16 \$	924 \$	3202 \$	46 \$
20-209-TP-1-COMP		20531 \$	4066 \$	901 \$	207 \$	504 \$	8974 \$		4 \$	862 \$	3466 \$	70 \$
20-209-TP-2-COMP		15149 \$	8557 \$	1751 \$	153 \$	1248 \$	25808 \$		126 \$	735 \$	1272 \$	206 \$
20-209-WR2-A			1841.98	849.296	209.715 *		9026.8			111.608 *	888.26	91.82
20-209-WR2-B			1537.39	1733.43		315.756 *	14596					
20-209-WR-1			1467.02	1908.3		347.375 *	10166.7			116.119 *	2101.39	98.7016
20-209-WR-1-COMP		30352 \$	1677 \$	1123 \$	233 \$	302 \$	10397 \$	7 \$		87 \$	1953 \$	62 \$
20-209-WR-3	133 \$	29899 \$	1513 \$	1797 \$	102 \$	278 \$	9771 \$	72 \$		233 \$	1481 \$	70 \$

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
20-209-TP1A-A	218.315			565.149	206.328		406.736	256.323			8.49177 *
20-209-TP1A-B	210.736			600.935	230.601		314.278	262.393	92.9029 *		
20-209-TP1A-C	230.28		4.37099 *	200.363	103.284		46.7432 *	397.046			8.4539 *
20-209-TP1B-A	184.726			467.853	178.169		293.976	218.523			11.3133 *
20-209-TP1B-B	222.111			34.9933 *	98.7192			439.528			10.1695 *
20-209-TP2-A	282 \$		1 \$	342 \$	95 \$	51 \$	151 \$	369 \$	65 \$	10 \$	8 \$
20-209-TP2-B	265 \$		1 \$	339 \$	92 \$	4 \$	160 \$	351 \$	69 \$	6 \$	11 \$
20-209-TP-1-COMP	251 \$		1 \$	365 \$	112 \$		182 \$	282 \$	12 \$	6 \$	8 \$
20-209-TP-2-COMP	225 \$		2 \$	113 \$	98 \$		39 \$	464 \$	38 \$	14 \$	8 \$
20-209-WR2-A				154.67	116.119		52.9315 *	447.171			
20-209-WR2-B	181.536										
20-209-WR-1	343.527			916.167	177.675		241.55	387.771	108.979 *		20.5378 *
20-209-WR-1-COMP	264 \$		1 \$	359 \$	154 \$		209 \$	353 \$	48 \$		6 \$
20-209-WR-3	300 \$		1 \$	1085 \$	133 \$	178 \$	275 \$	406 \$	132 \$	7 \$	16 \$

* - Estimated Quantity

\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

MAXVILLE TAILINGS
PA NO. 20-209

AIMSS SCORESHEET

SITE NAME: MAXVILLE TAILS/LONDONDE

PA NUMBER: 20-209

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	129.963
6		WELLS - 1 MI. x 2.5		77.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		15
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	102.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	5328483
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	131.266
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	23
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	1207647
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	300
27		LIKELIHOOD SCORE	LINES 25 + 26C	300
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.759
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		10
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	35
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	7970
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		250
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	650
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.746
40	DIRECT CONTACT	POPULATION - 1 MILE		1
41	TARGETS	NEAREST RESIDENCE		10
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 - 42	21
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	10183
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			65.54
	(LINES 10 + 24 + 35 + 44) / 100,000			

SITE NAME:MAXVILLE TAILS/LONDONDE

PA NUMBER: 20-209

LINE NO.	SITE SAFETY		
1	THREAT	ACCESSIBILITY	20
2	HAZARDS	OPEN SHAFTS	100 EA.
3		OPEN ADITS	50 EA.
4		UNSTAB. HIWALLS / PITS	75 EA.
5		HAZ. STRUCTURES	40 EA.
6		EXPLOSIVES	0
7		HAZ. MATERIALS	0
8		HAZARDS SCORE	SUM LINES 2 - 7
9	TARGETS	POPULATION - 1 MILE	1
10		NEAREST RESIDENCE	10
11		RECREATIONAL USE	10
12		TARGETS SCORE	SUM LINES 9 - 11
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000
			16.80

**SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES**

TABLE 1

-- DATA SUMMARY TABLE - Soil and Sediment Samples

SI SITE NAME	Londonderry Landfill, Montana	Upstream Sediments	Hopper Tailings	Mid-site Sediments	NW Tailings
SAMPLING POINT	LASSISL1	LASSISL1	LASSISL1	LASSISL1	LASSISL1
SAMPLE ID	305056	305057	305058	305059	305060
SAMPLING DATE	11/28/89	11/28/89	11/28/89	11/28/89	11/28/89
SAMPLE DEPTH	Surficial	Surficial	Surficial	Surficial	Surficial
SAMPLE MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
ANALYTE					
INORGANIC ANALYTE (ppm)					
Antimony	25.5 J	ND	139 J	ND	83.4 J
Arsenic	2440	71.3	2590	129	992
Beryllium	ND	0.83	ND	ND	ND
Cadmium	2.2	25.9	ND	12	1.8
Chromium	2.9	2.9	ND	3.5	ND
Copper	15.4 J	25 J	8.4 J	3.6 J	5.7 J
Lead	472	79.7	768	62	980
Mercury	0.52	4.4	1.4	0.94	1.7
Nickel	ND	ND	ND	ND	ND
Selenium	17.7	10.1	56.8	2.7	60
Silver	ND	ND	0.49	ND	ND
Thallium	157 J	227 J	181 J	160 J	175 J
Zinc	134	252	48.4	227	121
Barium	10200	3020	4840	3140	4900
Iron	5.8	3170	1.6	3738	29.5
Manganese	6.6	7.6	3.6	6.8	ND
Vanadium	3.1 J	1210 J	392 J	1080 J	423 J
Aluminum	ND	4.4	0.74	3.1	ND
Cobalt	ND	1660	ND	1030	ND
Magnesium	568	3190	754	1800	37.2
Calcium	ND	ND	ND	ND	ND
Sodium	ND	ND	ND	ND	ND
Potassium	ND	ND	ND	ND	ND
Cyanide	ND	ND	ND	ND	ND
OTHER					
pH	N/A	N/A	N/A	N/A	N/A
Percent Solids	81.7	80	92.4	93.2	90.9
Percent Moisture, Undecanted	N/A	N/A	N/A	N/A	N/A

KEY: N/A - Not Analyzed
ND - Not Detected

J - reported value is ESTIMATED

NOTE: Only inorganics analyses were conducted on Londonderry samples

-- DATA SUMMARY TABLE - Water Samples

TABLE 1

SI SITE NAME	Londonerry Landfill, Montana	QC Sample	Upstream Water	Mid-Site Water	Adit Discharge	Tailings Discharge
SAMPLING POINT	LASS10C1	LASS10C1	LASS10C1	LASS10C2	LASS10C3	LASS10C4
SAMPLE ID	305052	305046	305047	305047	305048	305048
CCN	11/28/89	11/28/89	11/28/89	11/28/89	11/28/89	11/28/89
SAMPLING DATE	0	0	0	0	0	0
SAMPLE DEPTH	WATER	WATER	WATER	WATER	WATER	WATER
SAMPLE MATRIX	WATER	WATER	WATER	WATER	WATER	WATER
ANALYTE	INORGANIC ANALYTE (ppb)	ND	7.6 J	ND	ND	39.9
Antimony	ND	ND	7.6 J	ND	ND	314
Arsenic	ND	ND	ND	8.8 J	2590	ND
Beryllium	ND	ND	ND	ND	2.2	ND
Cadmium	ND	ND	ND	ND	15.2 J	ND
Chromium	ND	ND	ND	ND	ND	ND
Copper	ND	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	2.8	2.3	ND	ND
Nickel	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	114	117	2560	152
Barium	ND	ND	ND	ND	24.8	19.7
Iron	ND	ND	ND	ND	18500	ND
Manganese	ND	ND	103	103	1270	ND
Vanadium	3.6	ND	ND	ND	ND	ND
Aluminum	ND	ND	ND	ND	ND	ND
Cobalt	3.5	ND	ND	ND	7.7	3.9
Magnesium	66.6	14000	14000	14300	25000	24400
Calcium	ND	40900	41400	41400	61900	57100
Sodium	1600	10400	10600	10600	4380	6050
Potassium	ND	3910	3990	3990	ND	ND
Cyanide	ND	ND	ND	ND	ND	ND

KEY: N/A - Not Analyzed
ND - Not Detected

J - reported value is ESTIMATED

NOTE: Only inorganics analytes were conducted on Londonerry samples

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: BANNER TAILINGS PA#: 20-175

Date: June 21, 1993 Time: 0900-1300

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Lasher, Pioneer

Visitors: Earl McCurley, MDSL
Tim Pfahler, MDSL helicopter pilot

Weather/Seasonality Observations: Partly cloudy; rain in the
afternoon; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: TP-1
northwest; #2: TP-1 panorama; #3: TP-1 northeast; #4: Sluiceway;
#5: Millsite and top of waste rock dump; #6: Shaft and north end
of WR-1; #7: South end of dump; #8: SE-2 location downstream of
dumps; #9: SE-1 location upstream of site.

Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms):
Access to site was by helicopter, but the site is accessible by
road.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Relatively
small amount of tailings spread/spilled over a large area; would
be easy to consolidate to one location and revegetate. Move waste
rock dumps out of river and revegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BANNER TAILINGS PA#: 20-175

Legal Description: T 4N ; R 16W ; Sec. 36 , SE1/4 SW1/4 1/4

County: GRANITE Mining District: MOOSE LAKE

Latitude: N 46° 03' 04" Longitude: W 113° 32' 04"

Primary Drainage Basin and Code: Middle Fork Rock Creek/17010202

Secondary Drainage Basin: Middle Fork Rock Creek

USGS Quadrangle map name(s): Moose Lake

Mine Type/Commodities: Hardrock/Gold, Silver

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): William H. Guanell, 7115 S. Holmes, Idaho Falls, ID 83404. (208) 529-3377; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Other
side of Moose Lake from Old Dominion Mine and Mill.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 6000' , Slope 5° ,
Aspect West

Land use: Mining , Recreational X , Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? 3 acres.
Dimensions: 800 feet x 200 feet

Predominant vegetation types: Lodgepole pine

Access: roads - good X , poor , 4wd , trail .
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 7 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on a bench above the perennial Middle Fork Rock Creek, which flows north through the site.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?

Shafts - Yes X, No , # 1, Comment Caved

Adits - Yes , No X, # , Comment

Pits - Yes , No X, # , Comment

Placers - Yes , No X, # , Comment

Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three questions:

Period(s) of Operation: Unknown

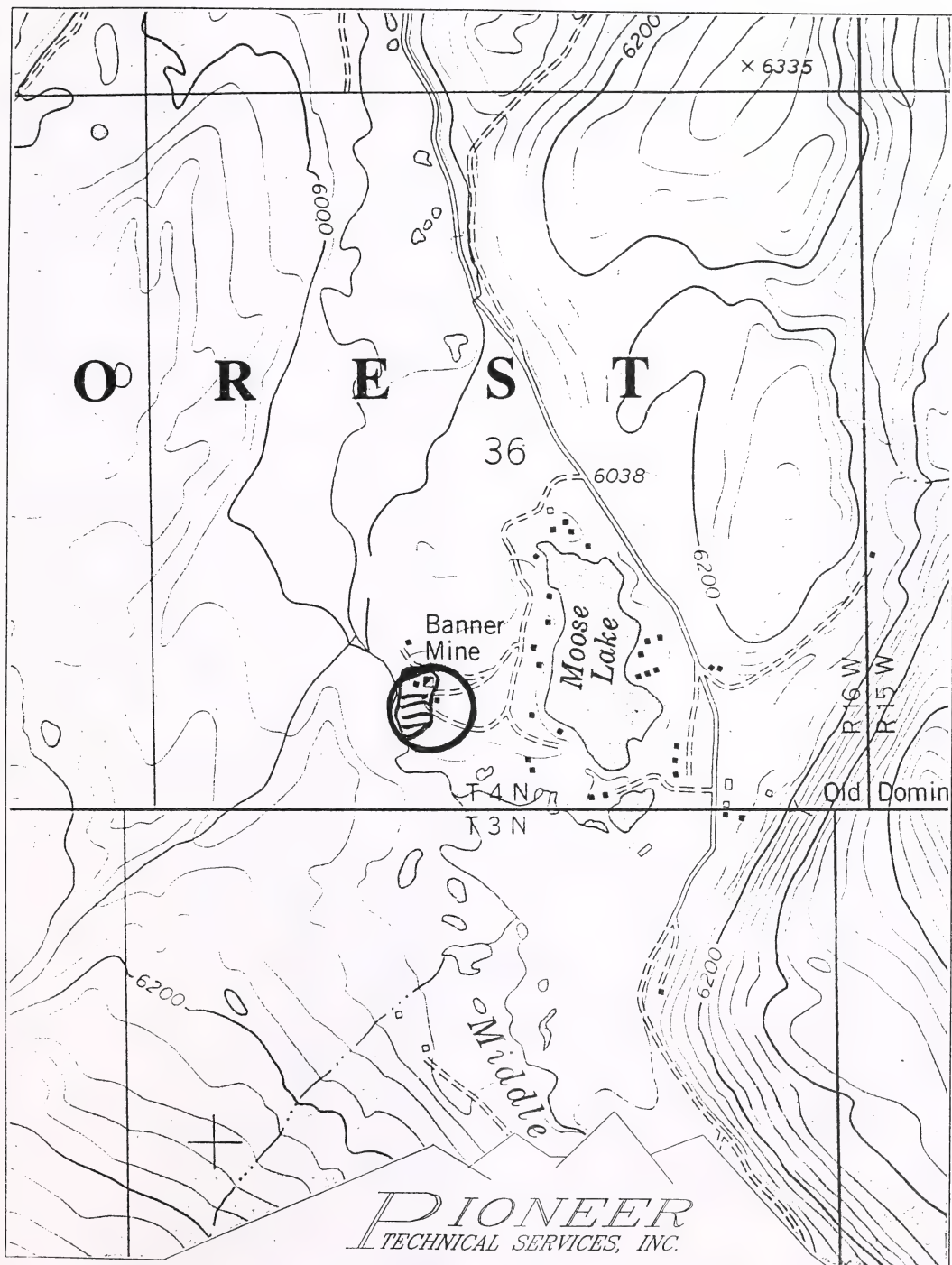
Origin of Ore Milled - Custom Mill Dedicated Mill X; Number and names of mines that supplied mill feed: Possibly the Old Dominion mine

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? No evidence of mill remains; however, must have been floatation due to the fine tailings.

Montana Bureau of Mines and Geology
Water Well Log Data

10/22/1993

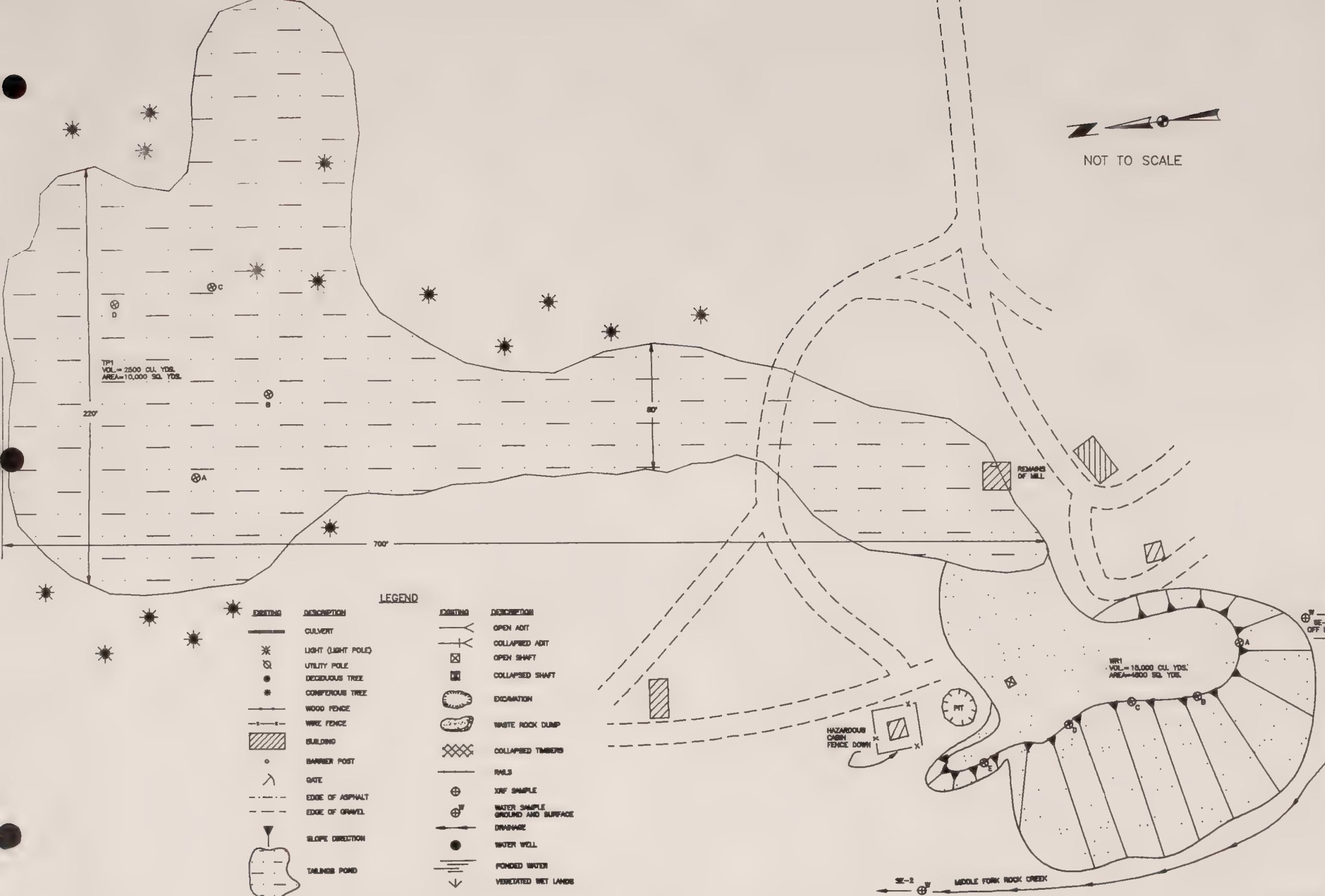
Well No.	Location	Depth	Yield	Static Water Level
M:51398	04N 16W 25 AAC	32.0	30.0	7.00
M:51399	04N 16W 25 ADB	10.0	15.0	8.00
M:51400	04N 16W 25 CABC	12.0	15.0	10.00
M:51401	04N 16W 25 CBCD	40.0	20.0	8.00
M:5338	04N 16W 25 CCBB	0.0	0.0	0.00
M:51402	04N 16W 36 DC	75.0	40.0	18.00
M:50594	03N 16W 01 AA	53.0	25.0	22.00



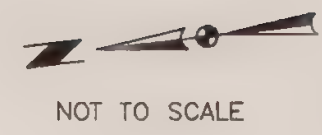
BANNER TAILINGS, P.A. NO. 20-175

T04N, R16W, SECTION 36

SCALE: 1" = 1000'



LEGEND	
	EXISTING CULVERT
	LIGHT (LIGHT POLE)
	UTILITY POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	WOOD FENCE
	WIRE FENCE
	BUILDING
	BANNER POST
	GATE
	EDGE OF ASPHALT
	EDGE OF GRAVEL
	SLOPE DIRECTION
	TAILINGS POND
	EXISTING OPEN ADIT
	EXISTING COLLAPSED ADIT
	EXISTING OPEN SHAFT
	EXISTING COLLAPSED SHAFT
	EXISTING EXCAVATION
	EXISTING WHITE ROCK DUMP
	EXISTING COLLAPSED TIMBERS
	RAILS
	TOXIC SAMPLE
	WATER SAMPLE GROUND AND SURFACE
	DRAINAGE
	WATER WELL
	PONDED WATER
	VEGETATED WET LANDS



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

BANNER PA# 20-175
MOOSE LAKE DISTRICT GRANITE COUNTY

DRAWN BY JTP DATE 8 OCT 83
DESIGNED TBR JOB NO. 93-17
APPROVED MJB F.B. NO.

PIONEER
ENGINEERING CONSULTANTS

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
MONTANA WASHINGTON

TDSH

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Mostly sand sized grains

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Not really an impoundment;
tails are uniform, unstratified.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Wet
in basin (north); dry elsewhere.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment

Comments on potential for mitigation: Move to one impoundment and add nutrients; metals are low.

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAIN- MENT	PH SU (P/S)*	RADIO- ACTIVITY (MR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	15,000	South portion of pile	None	6.0 (D)	0.04	20-175-WR-1	06/21/93 1215	T-Metals, ABA
WR-1B	WR		Southwest portion of pile	None	6.4 (D)	0.05			
WR-1C	WR		West, center portion of pile	None	4.0 (D)	0.04			
WR-1D	WR		Northwest portion of pile	None	5.5 (D)	0.07			
WR-1E	WR		Furthest north portion of pile	None	6.4 (D)	0.05			
TP-1A	TAIL	2,500	On tailings pile; 0-9"	None	6.0 (D)	0.045	20-175-TP-1	06/21/93 1230	T-Metals, ABA, CN
TP-1B	TAIL		Southeast of TP-1A; 0-10"	None	6.9 (D)	0.045			
TP-1C	TAIL		Low point on pile; 0-12"	None	5.6 (S)	0.04			
TP-1D	TAIL		Northeast portion of pile, north of TP-1C; 0-9"	None	5.8 (S)	0.035			

*D-Direct reading (Kelway Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 20-175-WR-1 is composite of WR-1A through -1E. 20-175-TP-1 is composite of TP-1A through -1D.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes ☐, No ☒, Number: Identification:

Filled shafts: Yes ☐, No ☒, Number: Identification:

Seeps/Springs: Yes ☐, No ☒, Number: Identification:

Groundwater wells within 4 miles?: Yes ☒, No ☐;
Number of well logs: 13

Distance to nearest well used for drinking? Approx. 1/4 mile to Moose Lake residences

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite ☐, Probable ☐, Possible ☒, Unlikely ☐.

Tailings, no drainage; could leach locally.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Middle Fork Rock Creek

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): WR-1

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 40 during investigation
High Flow: 500 cfs, Average Flow: 50 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet between WR-1 and Middle Fork Rock Creek.

Surface water draining onto or through waste sources: Yes , No X, Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, fishery, wetlands

Observed erosional/sedimentation/stream turbidity problems? Yes X, No , Distance downstream (ft)? 100 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Middle Fork Rock Creek erosion undercuts WR-1 along the west side of the site.

SAMPLERS: Tuesday, Belanger

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Only parameters were measured on Rock Creek because of high flow.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO₃)
Presence of evaporative salt deposits? (ESD)
Discolored or turbid seepage? (SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?
Presence of ferric hydroxide precipitates? (FEOX)
Presence of burned or stressed vegetation? (VEG)
pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres

Wetlands present: Yes , No X, Describe: Only near creek

Carbonate rocks/soils: Yes , No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 X ;
100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 1/4 mile to Moose Lake residences

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Belanger

[illegible]

Notes and Clarifications: Tailings are partially wet (basin in north end) and surrounded by streets, minimizing wind release. Surface water on tailings flows to north basin with no exit.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe: _____

Population within 1 mile: 1-10____; 10-30____; 30-100 X; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments _____

Evidence of recreational use on site: Yes X, No____, Describe: Litter,
use of cabins _____

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment _____
Wilderness Area -	Yes____, No <u>X</u> , Comment _____
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Peregrine Falcon</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality - High____, Medium X, Low____
Wetlands Frontage - High X, Medium____, Low____
Fisheries Habitat and Species Classification - 3
Sport Fishery Classification - 1

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes____, No X, Number____, types and locations:____

Hazardous structures: Yes X, No____, Number 1, types and locations:____
Old dilapidated cabin

Unstable highwalls, pits, trenches, slopes: Yes X, No____, Number 1,
types and locations: WR-1 has a very steep slope where Rock Creek under
cuts through base.

Unstable waste piles, impoundments, undercut banks: Yes X, No____,
Number 1, types and locations: WR-1 undercut by creek.

Fire and/or Explosion hazards: Yes____, No X, Explain:____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Banner Mine, Prepared by Northern Engineering and Testing, August 26, 1988.

USGS, Topographic Map, Moose Lake, Montana, 7 1/2 minute Quadrangle, 1974.

LABORATORY ANALYTICAL DATA

**BANNER TAILINGS
PA NO. 20-175**

Banner PA# 20-175
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/21/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-175-SE-1	11 J	31.8	0.6 U	1.5 U	5.8	8.2	4660	0.055 JX	88	4	6 U	4 UJ	22	NR
20-175-SE-2	7 J	102	0.7 U	2.3	6.8	11.7	5580	0.052 JX	121	6	14	5 UJ	32	NR
20-175-TP-1	155 J	38.1	1.1	1.3 U	1 U	65.1	3990	1.46 JX	7.8	2 U	898	220 J	36	0.265
20-175-WR-1	140 J	84.6	0.5	1.2	0.9 U	114	17800	1 JX	223	4	424	125 J	35	NR
BACKGROUND	11 J	267	1.7	11	8.7	7.8	12800	0.08 JX	250	9	15	5 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

LEGEND

SE1 - Upstream of dumps.
SE2 - Downstream of dumps.
TP1 - Composite of subsamples TP1A through 1D.
WR1 - Composite of subsamples WR1A through 1E.
BACKGROUND - From the Montana Prince Mine (41-009-SS-1)

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. v/1000	NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR v/1000	ACID BASE POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000
20-175-TP-1	0.04	1.25	0.93	-0.3	0.03	<0.01	0.01	0	0	0.93
20-175-WR-1	0.23	7.19	1.9	-5.2	0.22	<0.01	0.02	0	0	1.9

XRF ANALYSIS RESULTS

**BANNER TAILINGS
PA NO. 20-175**

XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-175-TP1-A			1168.44	460.763			3761.21		86.6318 *		113.479 *	42.7006
20-175-TP1-B			1470.17	454.548			6952.87					34.2806
20-175-TP1-C			1693.91	528.378			6150.7					50.6503
20-175-TP1-D			1859.78	573.358			7536.11		72.2688 *		157.075 *	54.5545
20-175-TP-1-COMP			1367.27	473.374			6910.98		81.6793 *		96.6941 *	39.8466
20-175-WR1-A		26759.5	1686.46	792.893	126.101 *		35761.8		159.151 *		232.054 *	172.797
20-175-WR1-B			3016.63	247.224 *	190.588 *		7094.69		53.6947 *	47.4567 *		122.824
20-175-WR1-C			1920.48	1048.54			19909.7		164.769 *		147.706 *	51.9796
20-175-WR1-D			1806.16	1289.11			24539.7		87.2736 *		136.276 *	55.7171
20-175-WR1-E			2105.48	706.789			22391.1		105.663 *			99.962 *
20-175-WR-1-COMP			2391.91	855.237	116.085 *		21104.8		87.4637 *			112.877
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-175-TP1-A	90.3902			489.707	83.1239		274.956	76.4512	61.4845 *			
20-175-TP1-B	80.1425			1111.57	72.3216		727.307	111.715	72.5507 *			
20-175-TP1-C	84.4951			793.767	69.9743		477.373	168.048	65.642 *			
20-175-TP1-D	112.454			635.266	70.2841		427.906	172.995				
20-175-TP-1-COMP	119.232			880.753	77.3169		463.889	152.354	49.7189 *			
20-175-WR1-A	176.159			825.192	123.39		340.196	323.589	76.734 *			
20-175-WR1-B	123.412			358.555	104.087			253.636				
20-175-WR1-C	168.456			457.903	136.088		216.286	286.597				
20-175-WR1-D	233.749			361.492	185.88		114.224 *	367.412	64.0874 *			
20-175-WR1-E	166.759			74.9086 *	130.32			560.604	64.8715 *			
20-175-WR-1-COMP	175.565			361.079	129.32		113.255 *	370.756	82.8161 *			

* - Estimated Quantity

\$ - Unvalidated Data

**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**BANNER
PA NO. 20-175**

AIMSS SCORESHEET

 SITE NAME:
 PA NUMBER:

 BANNER TAILINGS
 20-175

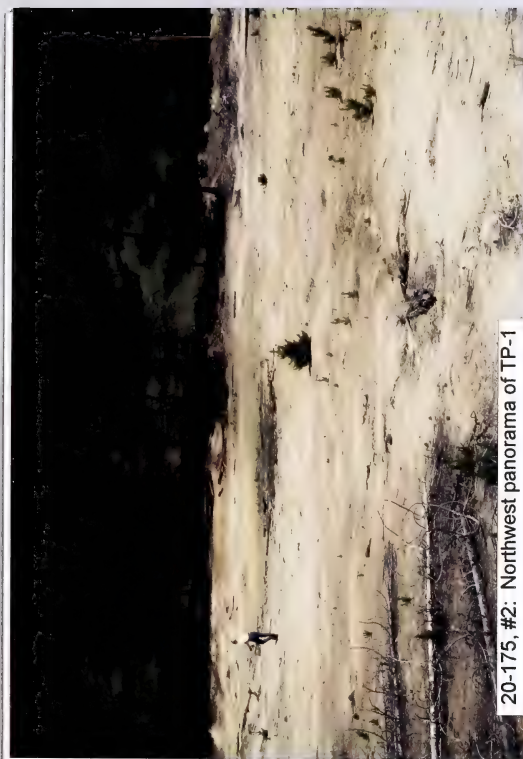
LINE NO.				
1		GROUNDWATER PATHWAY		
2		OBSERVED RELEASE		0
3A	GW - LIKELIHOOD	EXCEEDENCES		0
3B	OF RELEASE	CONTAINMENT		20
3C		GW DEPTH		10
4		POTENTIAL TO RELEASE	LINES 3A x 3B	200
5		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
6	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	7.833
7		WELLS - 1 MI. x 2.5		17.5
8	GW - TARGETS	WELLS - 1 TO 4 MI		6
9		NEAREST WELL		5
10		TARGETS SCORE	LINES 6 + 7 + 8	28.5
		GROUNDWATER SCORE	LINES 4 x 5 x 9	44648
11		SURFACE WATER PATHWAY		
12		OBSERVED RELEASE		0
13A	SW - LIKELIHOOD	EXCEEDENCES		0
13B	OF RELEASE	CONTAINMENT		20
13C		DISTANCE TO SW		20
14		POTENTIAL TO RELEASE	LINES 13A x 13B	400
15		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
16	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	8.403
17		DRINKING WATER POP'N		0
18		IMPACTED DRAINAGE		0
19	SW - TARGETS	WETLANDS		10
20		FISHERY		5
21		RECREATION		5
22		IRRIGATION/STOCK		2
23		T & E SPECIES HABITAT		5
24		TARGETS SCORE	SUM LINES 16 - 22	27
		SURFACE WATER SCORE	LINES 14 x 15 x 23	90752
25		AIR PATHWAY		
26A	AIR - LIKELIHOOD	OBSERVED RELEASE		0
26B	OF RELEASE	CONTAINMENT		15
26C		DISTANCE TO POPULATION		10
27		POTENTIAL TO RELEASE	LINES 26A x 26B	150
28		LIKELIHOOD SCORE	LINES 25 + 26C	150
29	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.204
30		POPULATION - 4 MILES		30
31	AIR - TARGETS	NEAREST RESIDENCE		5
32		WETLANDS		10
33		PARKS / WILDERNESS		0
34		T & E SPECIES HABITAT		5
35		TARGETS SCORE	SUM LINES 29 - 33	50
		AIR PATHWAY SCORE	LINES 27 x 28 x 34	1530
36		DIRECT CONTACT PATHWAY		
37A	LIKELIHOOD OF	OBSERVED EXPOSURE		50
37B	EXPOSURE	ACCESSIBILITY		20
37C		DISTANCE TO POPULATION		10
38		POTENTIAL EXPOSURE	LINES 37A x 37B	200
39		LIKELIHOOD SCORE	LINES 36 + 37C	250
40	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.190
41	DIRECT CONTACT	POPULATION - 1 MILE		30
42	TARGETS	NEAREST RESIDENCE		5
43		RECREATIONAL USE		10
44		TARGETS SCORE	SUM LINES 40 - 42	45
		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	2138
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			
	(LINES 10 + 24 + 35 + 44) / 100,000			1.39

LINE NO.	SITE SAFETY			20-175
	THREAT	ACCESSIBILITY		
1				20
2		OPEN SHAFTS	100 EA.	(
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	115
9		POPULATION - 1 MILE		30
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 - 11	45
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	103.50

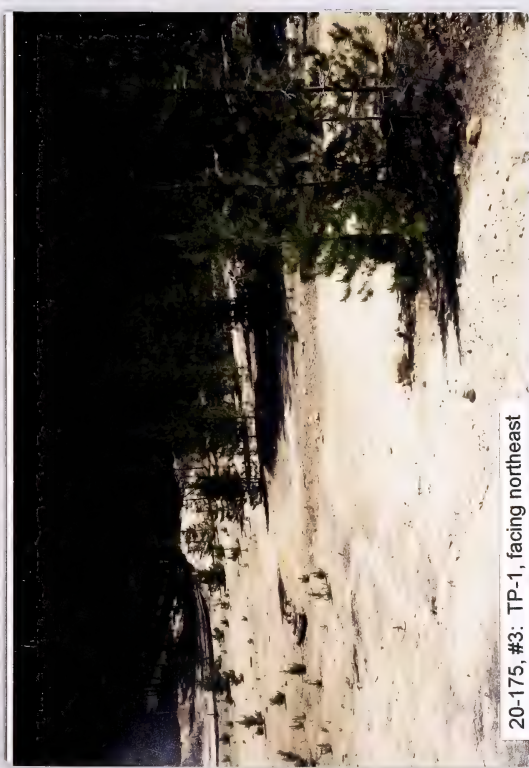
SITE NAME: BANNER TAILINGS
PA NUMBER: 20-175



20-175, #1: Northwest panorama of TP-1



20-175, #2: Northwest panorama of TP-1



20-175, #3: TP-1, facing northeast



20-175, #4: Sluiceway



20-175, #5: Millsite and top of dump



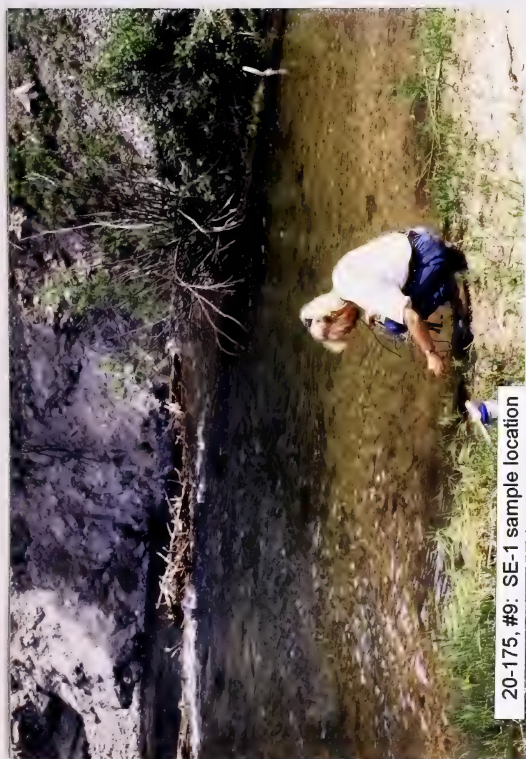
20-175, #6: Shaft and north end of WR-1



20-175, #7: South end of dump



20-175, #8: SE-2 sample location



20-175, #9: SE-1 sample location

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: OLD DOMINION MINE PA#: 20-180

Date: June 21, 1993 Time: 1410-1830

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Lasher, Pioneer

Visitors: Earl McCurley, MDSL
Tim Pfahler, MDSL Helicopter Pilot

Weather/Seasonality Observations: Partly cloudy; rain on and
off; mild temperature; cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #10, #11: TP-1;
#12, #13: WR-2 from below; #14: Mill building from below.
Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms):
Access to site was by helicopter, but can be accessed by road.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Tailings have
revegetated naturally. Waste rock piles are steep and need to be
smoothed and revegetated.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): OLD DOMINION MINE PA#: 20-180

Legal Description: T 4N ; R 16W ; Sec. 36 , SE1/4 SE1/4 1/4

County: GRANITE Mining District: MOOSE LAKE

Latitude: N 46° 02' 55" Longitude: W 113° 31' 30"

Primary Drainage Basin and Code: Middle Fork Rock Crk./17010202

Secondary Drainage Basin: Middle Fork Rock Creek

USGS Quadrangle map name(s): Moose Lake

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): Bartley T. Garvey, 8610 Washington Avenue, Alexander, VA 22309; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Across Moose Lake from Banner mine.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 6250' , Slope 20°-30° , Aspect Northwest

Land use: Mining , Recreational X , Residential , Urban , Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? 2.7 acres.
Dimensions: 300 feet x 400 feet

Predominant vegetation types: Lodgepole pine

Access: roads - good X , poor , 4wd , trail .
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 7 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Geological formation is a series of indurated shales and quartzites of the Precambrian Belt Formation. Site lies on the west side of Moose Lake and on the east side of the perennial Middle Fork Rock Creek, which flows north away from the site. Water leaving the site would flow west to Moose Lake or to the creek.

Mining/milling history, ore type/tenor, host rock, gangue: The site operated from 1936 to 1938. Ore minerals are native gold with silver; brittle quartzite shattered and cracks cemented together with vein material.

Mine Operation?

Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 2, Comment Caved and sealed
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three questions:

Period(s) of Operation: 1936 to 1938

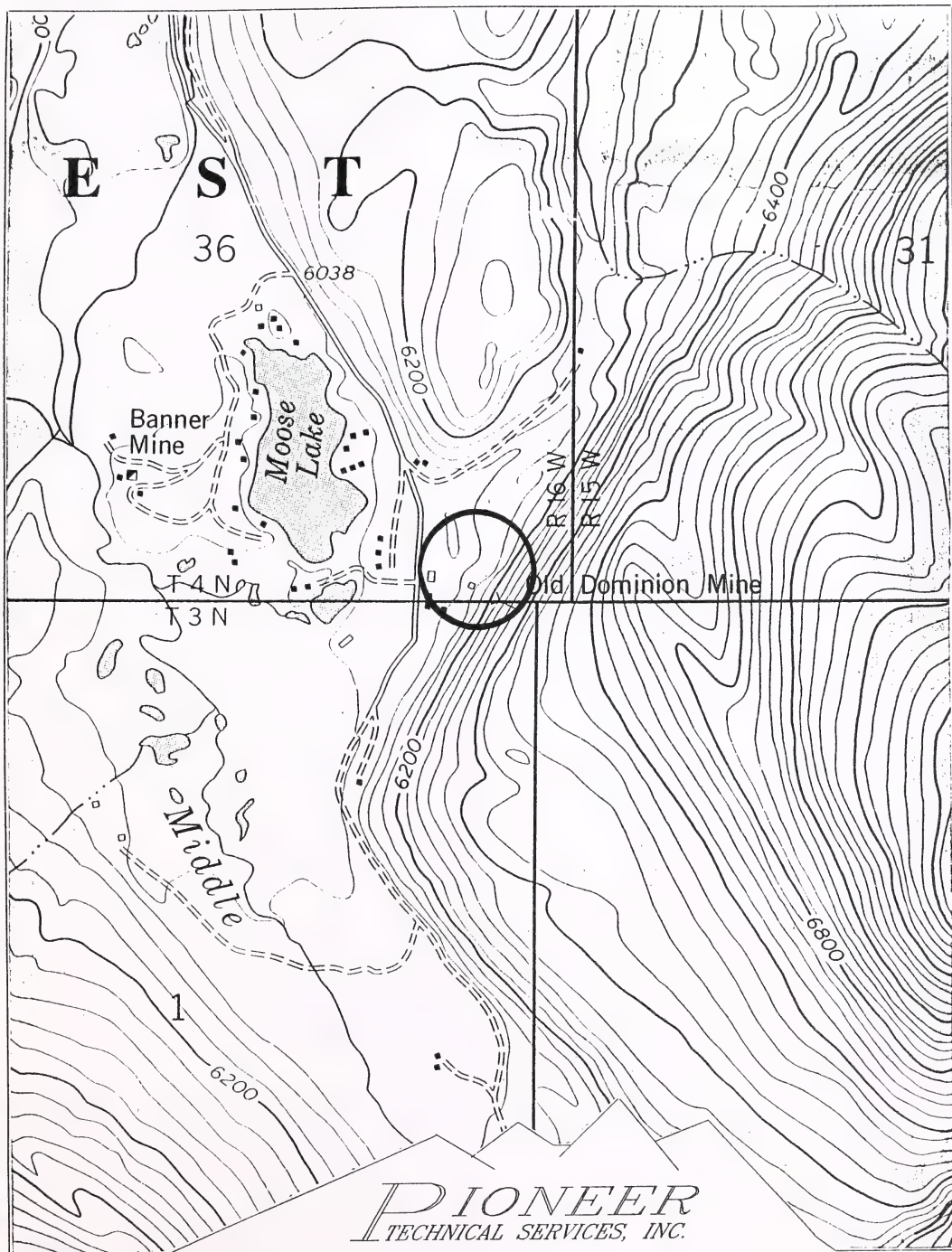
Origin of Ore Milled - Custom Mill Dedicated Mill X; Number and names of mines that supplied mill feed: Possibly dedicated mill due to no other close proximity sites.

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? 60-ton mill present in 1935.

Montana Bureau of Mines and Geology
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
M:51398	04N 16W 25 AAC	32.0	30.0	7.00
M:51399	04N 16W 25 ADB	10.0	15.0	8.00
M:51400	04N 16W 25 CABC	12.0	15.0	10.00
M:51401	04N 16W 25 CBCD	40.0	20.0	8.00
M:5338	04N 16W 25 CCBB	0.0	0.0	0.00
M:51402	04N 16W 36 DC	75.0	40.0	18.00
M:50594	03N 16W 01 AA	53.0	25.0	22.00

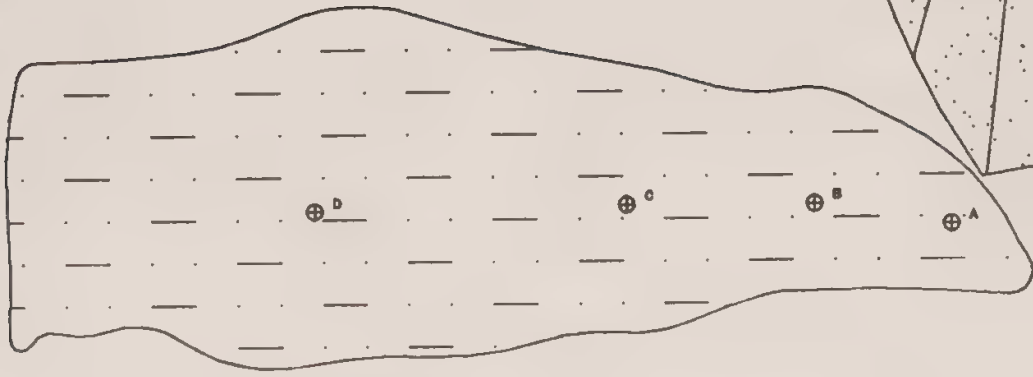
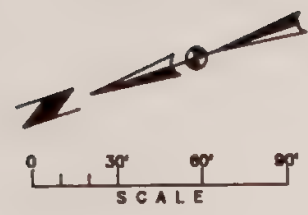


PIONEER
TECHNICAL SERVICES, INC.

OLD DOMINION, P.A. NO. 20-180

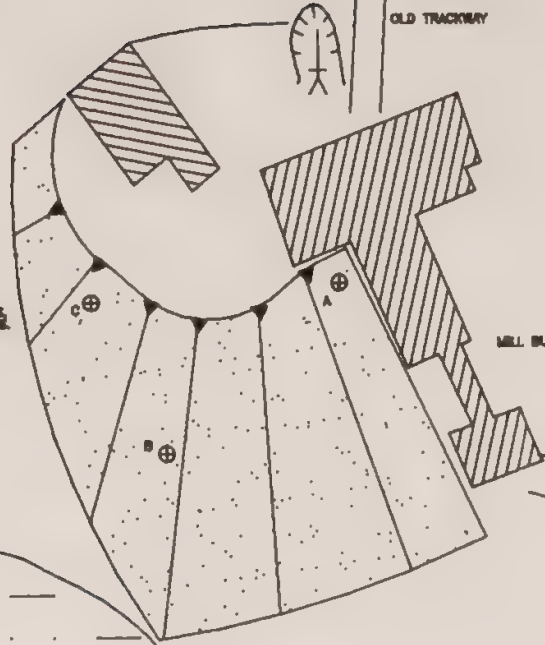
T04N, R16W, SECTION 36

SCALE: 1" = 1000'



TP1
VOL=6800 CU. YDS.
AREA=3400 SQ. YDS.

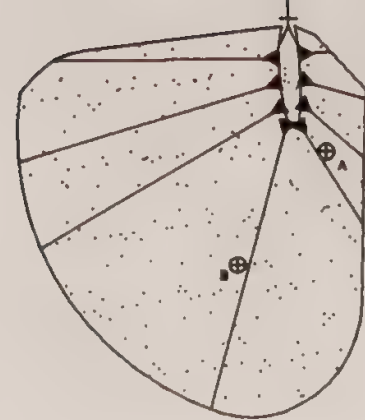
WT-2
VOL=1200 CU. YDS.
AREA=2800 SQ. YDS.



MILL BUILDING



CABINS



WT-1
VOL=1800 CU. YDS.
AREA=1800 SQ. YDS.

OLD TRACKWAY

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WASTE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBERS
	BUILDING		RAILS
	BARRIER POST		XRF SAMPLE
	GATE		WATER SAMPLE GROUND AND SURFACE
	EDGE OF ASPHALT		DRAINAGE
	EDGE OF GRAVEL		WATER WELL
	SLOPE DIRECTION		PONDED WATER
	TAILINGS POND		VEGETATED WET LANDS

GW-2 (OFF MAP)

GW-1 (OFF MAP)

TO PHILPSBURG

20-180.DWG SHEETS

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

OLD DOMINION PA# 20-180
PHILPSBURG DISTRICT GRANITE COUNTY

SHEET NO.

PIONEER
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPOKANE

DRAWN BY: JTP DATE: 8 OCT 93
DESIGNED BY: JTP JOB NO.: 20-17
APPROVED BY: JTP F.B. NO.:
THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
MONTANA
WASHINGTON

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Mostly coarse to fine sands; some clays at depth.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Not really an impoundment; tails just discharged from mill and followed gravity gradients. No stratification; color change only in one location.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Wet

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundments observed (in a "natural" depression). Revegetation naturally occurring.

Comments on potential for mitigation: Tails are approx. 3/4 of the way vegetated. Wetlands may be possible. Addition of nutrients would speed revegetation.

SOURCE INVENTORY FORM

SAMPLERS: Belanger, Lasher, McCurley

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAIN- MENT	pH SU (D/S)*	RADIO- ACTIVITY (MR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	1,500	Southeast portion of WR-1; light tan	None	6.8 (D)	0.035	20-180-WR-1	06/21/93 1430	T-Metals, ABA
WR-1B	WR		West portion of WR-1; dark tan	None	6.9 (D)	0.04			
WR-2A	WR	5,200	West end of WR-2 near mill	None	6.6 (D)	0.04			
WR-2B	WR		Northwest corner of WR-2	None	6.8 (D)	0.05			
WR-2C	WR		Near center of WR-2 below cabin	None	6.8 (D)	0.04			
TP-1A-A	TAIL	5,600	Southern most tails near mill; 0'-2'	None	6.8 (D)	0.03	20-180-TP-1	06/21/93 1445	T-Metals, ABA, CN-
TP-1A-B	TAIL		Southern most tails near mill; 2.5'-3'	None	NM	NM			
TP-1B-A	TAIL		50 feet north of mill; 0'-2'	None	6.9 (D)	0.035			
TP-1B-B	TAIL		50 feet north of mill; 2'-7'	None	6.6 (D)	0.03			
TP-1C-A	TAIL		100 feet north of mill; 0'-2'	None	6.0 (D)	0.04			
TP-1D-A	TAIL		Middle of pond; 0'-2'	None	5.9 (D)	0.03			

* D-Direct reading(Kelway Meter); S-Saturated paste(Orion Meter)

Comments or deviations from SOPs: 20-180-WR-1 is composite of WR-1A and -1B, and WR-2A through -2C. 20-180-TP-1 is composite of TP-1A-A, TP-1B-A and -1B-B, TP-1C-A, and TP-1D-A.
 NM = Not Measured

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes ☐, No ☒, Number: Identification:

Filled shafts: Yes ☐, No ☒, Number: Identification:

Seeps/Springs: Yes ☐, No ☒, Number: Identification:

Groundwater wells within 4 miles?: Yes ☒, No ☐;
Number of well logs: 13

Distance to nearest well used for drinking? 1/8 mile (well is 250');
several residences downgradient from the site.

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite ☐, Probable ☐, Possible ☒, Unlikely ☐.

Waste rock and tailings contained only slightly elevated metal values;
groundwater is fairly shallow, as indicated by nearby lake.

Other observations/notes: N/A

SAMPLERS: McCurley

[illegible]

PLON: Estimated (E) or Measured (M) from edit, shaft, snap or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes ☐, No ☒, Name(s): _____

Dry streambeds: Yes ☐, No ☒, Name(s): _____

Other surface water: Yes ☐, No ☒, Name(s)/Description: _____

Waste materials within any floodplain: Yes ☐, No ☒ Source ID(s): _____

Approximate Flood frequency? ☐ 1 yr, ☐ 10 yr, ☐ 100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow: _____, Average Flow: _____

Distance between waste source(s) and nearest surface water body (ft)?
Approx. 1/4 mile to Moose Lake

Surface water draining onto or through waste sources: Yes ☐, No ☒,
Describe: Runoff only

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Moose Lake most likely used for irrigation, residential, and possibly drinking water; downstream there is fishery, wetlands, and recreation.

Observed erosional/sedimentation/stream turbidity problems? Yes ☐,
No ☒, Distance downstream (ft)? _____ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): _____
N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

Evaluate each source in table on next page.

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

Area available for treatment (acres)? 2 acres in the area where
tailings are located.

Wetlands present: Yes X, No , Describe: Moose Lake across the road,
as well as the edge of tailings being part of the wetlands presently.

Carbonate rocks/soils: Yes , No X , Describe:

Population within 4-mile radius: 1-10___; 10-30___; 30-100 X;
100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or
greater___; Comments

Nearest residence(ft or miles)? 700 feet

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
----------	------	----------	-----	------

SAMPLERS: Tuesday

[illegible]

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X, Describe: _____

Population within 1 mile: 1-10____; 10-30____; 30-100 X; 100-300____; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____; Comments _____

Evidence of recreational use on site: Yes X, No____, Describe: _____
Campfires, tourists _____

Accessibility - Fences, warning signs, closed roads? Unrestricted _____

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment _____
Wilderness Area -	Yes____, No <u>X</u> , Comment _____
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Peregrine Falcon</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality - High____, Medium X, Low____
Wetlands Frontage - High X, Medium____, Low____
Fisheries Habitat and Species Classification - 3
Sport Fishery Classification - 1

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes____, No X, Number____, types and locations: _____

Hazardous structures: Yes X, No____, Number 4+, types and locations: _____
Several poor buildings, mill building, cabins, and generator building _____

Unstable highwalls, pits, trenches, slopes: Yes____, No X, Number____, types and locations: _____

Unstable waste piles, impoundments, undercut banks: Yes X, No____, Number 2, types and locations: Waste rock piles are steep and at angle of repose.

Fire and/or Explosion hazards: Yes____, No X, Explain: _____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Old Dominion mine, Prepared by Northern Engineering and Testing, August 28, 1988.

MDSL/AMRB Files, Report of W.M.H. Woodward, Mineral Examiner, on the Pick and Shovel and Old Dominion Lodes, Letter from W.M.H. Woodward, Mineral Examiner, to Adjustment, Deerlodge, March 26, 1935.

USGS, Topographic Map, Moose Lake, Montana, 7 1/2 minute Quadrangle, 1974.

LABORATORY ANALYTICAL DATA

OLD DOMINION
PA NO. 20-180



Old Dominion PA# 20-180
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/21/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-180-TP-1	13 J	225	0.6 U	1.4 U	4	28.5	6080	0.445 JX	29	3	103	4 UJ	9	0.282
20-180-WR-1	6 J	22.4	0.5 U	1.2 U	1 U	6.7	2280	0.195 JX	8.2	3	68	4 UJ	8	NR
BACKGROUND	11 J	267	1.7	11	8.7	7.8	12800	0.08 JX	250	9	15	5 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			SULFUR			PYRITIC SULFUR			ORGANIC SULFUR			PYRITIC SULFUR			SULFUR		
	%	u/1000	ACID BASE	%	u/1000	NEUTRAL POTENT.	%	u/1000	POTENT.	%	u/1000	ACID BASE	%	u/1000	POTENT.	%	u/1000	POTENT.
20-180-TP-1	0.01	0.31	0.31	1.06	0.75	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	1.06	1.06
20-180-WR-1	0.01	0.31	0.31	2.58	2.26	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.31	0.31	0.31	2.26	2.26	2.26	2.26

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO ₃ /L)
20-180-GW-1	0.98 U	116	2.57 U	9.7 U	6.83 U	55.5	15.3	0.038 U	4.08 U	12.7 U	0.38 U	30.7 U	12.8	101
20-180-GW-2	0.98 U	313	2.57 U	9.7 U	6.83 U	8.93	102	0.038 U	4.3	12.7 U	0.38 U	30.7 U	8.43	93.6

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N	CYANIDE
20-180-GW-1	127 <	5.0	5	0.08	NR
20-180-GW-2	139 <	5.0	6	0.09	NR

LEGEND

TP1 - Composite of subsamples TP1A-A, 1B-A, 1B-B, 1C-A, and 1D-A.
WR1 - Composite of subsamples WR1A, 1B, 2A, 2B, and 2C.
BACKGROUND - From the Montana Prince Mine (41-004-SS-1).

GW1 - Petroleum residue (upgradient) West of site.
GW2 - Floyd's residue (downgradient) North of site.

XRF ANALYSIS RESULTS

**OLD DOMINION
PA NO. 20-180**

XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Ag	U	Th	As	Sr
20-180-TP1A-A	91.5522	17605.4	1036.29	217.5 *	141.877 *		4713.36						19.4524 *
20-180-TP1A-B	93.7721	19925.7	988.727	240.691 *	100.294 *		4913.9		58.3763 *				18.4429 *
20-180-TP1B-A	121.831	17776.1	1039.8	251.728 *			6809.11		87.4632 *				22.2315
20-180-TP1B-B	120.328	17776.5	956.762	369.401			5678.86						20.102 *
20-180-TP1C-A	129.572	33597.4	1380.84	665.696			17894.3						25.5787
20-180-TP1D-A	289.029	33087.8	4181.13	1573.87			10729.4						82.4668
20-180-TP-1-COMP	153.557	30931.9	1858.06	797.136			11560.9						31.9307
20-180-WR1-A	121.515	29820.6	1035.39	795.664			3894.03						31.2654
20-180-WR1-B	131.167	24675	1432.54	548.682			10004.3						31.3696
20-180-WR2-A	110.079	25869.3	8926.87	508.784			4633.24						47.4473
20-180-WR2-B	111.536	26071.1	1368.09	609.751			5564.45						25.3516
20-180-WR2-C	96.2455	21844.9	1224.94	344.45			6510.05						20.5074 *
20-180-WR-1-COMP	100.109	22074.8	2052.38	327.683			5587.57						27.8155
20-180-TP1A-A	91.5522			74.5173	64.1704			199.865					
20-180-TP1A-B	93.7721			81.5899	63.0865			212.625					
20-180-TP1B-A	121.831			104.054	61.9532			303.602					
20-180-TP1B-B	120.328			50.9464 *	71.3236			242.853					
20-180-TP1C-A	129.572			324.846	145.088			535.7					
20-180-TP1D-A	289.029			20.9953 *	110.505		40.4036 *	835.41					
20-180-TP-1-COMP	153.557			126.692	99.0215			457.758					
20-180-WR1-A	121.515			130.777	88.1352			298.74					
20-180-WR1-B	131.167			211.433	91.9885			247.268					
20-180-WR2-A	110.079			118.485	70.7552			389.539					
20-180-WR2-B	111.536			22.5987 *	89.4384			261.183					
20-180-WR2-C	96.2455			94.2198	71.077			283.335					
20-180-WR-1-COMP	100.109				77.7513			288.083					

* - Estimated Quantity

\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

OLD DOMINION
PA NO. 20-180

AIMSS SCORESHEET

SITE NAME: OLD DOMINION MINE
PA NUMBER: 20-180

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.430
6		WELLS - 1 MI. x 2.5		17.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		6
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	33.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	5762
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.475
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	27
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	513
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	200
27		LIKELIHOOD SCORE	LINES 25 + 26C	200
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.007
29		POPULATION - 4 MILES		30
30	AIR - TARGETS	NEAREST RESIDENCE		10
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	55
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	77
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	450
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.006
40	DIRECT CONTACT	POPULATION - 1 MILE		30
41	TARGETS	NEAREST RESIDENCE		10
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 - 42	45
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	122
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			0.06

LINE
NO.

SITE NAME:

OLD DOMINION MINE

PA NUMBER:

20-180

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	80
9		POPULATION - 1 MILE		30
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	45
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	72.00



20-180, #11: TP-1



20-180, #13: WR-2 (from below)



20-180, #10: TP-1



20-180, #12: WR-2 (from below)

TY

/ PIT

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ORE

MINE
D-180

20
6
0
0
80
0
0
80
30
10
5
45
2.00



20-180, #14: Mill building (from below)

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: BI-METALLIC/OLD RED PA#: 20-002

Date: June 22, 1993 Time: 1300-1930

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Cold; windy; occasional snow;
cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #19: Shaft and
buildings; #20: Upper millsite; #21: WR-1 north end; #22: WR-2
behind trees; #23: Lower mill (burned); #24: Mill and drainage used
for fluming tailings. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Two mills and no tailings impoundment; tailings flumed down drain-
age at least 1/2 mile (to a currently running stream). Tailings
observed along banks of stream for another 1000 feet, but not in
active sediments. Waste rock area has been disturbed by bull-
dozers. Background sample used is the same as background noted
as 20-110-SS-1.

Other Hazardous Materials/Substances Present: N/A

General comments on Potential Remedial Alternatives: Tailings are
mostly revegetated, but clog stream down to Douglas Creek; mill
area needs reclamation. Waste rock is unvegetated, steep, and
sulfide-rich; lime, smooth, topsoil, and revegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BI-METALLIC/OLD RED PA#: 20-002

Legal Description: T 7N ; R 13W ; Sec. 33 , NE1/4 SW1/4 1/4

County: GRANITE Mining District: PHILIPSBURG

Latitude: N 46° 18' 44" Longitude: W 113° 16' 16"

Primary Drainage Basin and Code: Flint Creek/17010202

Secondary Drainage Basin: Douglas Creek

USGS Quadrangle map name(s): Fred Burr Lake/Philipsburg

Mine Type/Commodities: Hardrock/Silver, Gold, Lead

Activity Status: Active , Inactive/Exploration X , Abandoned .

Ownership status: Known YX N ; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): Hope Resources
Box 791, Butte, MT 59702. (406) 443-2510; Deerlodge National
Forest.

Relationship to other mines/sites in the area/district: Just
below Granite Mountain workings in same drainage; Granite Mountain
mine is on the same ore shoot and was operated as one with this
site from 1898 to 1913.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? Air shaft has been grated by DSL.
The Philipsburg district is currently listed under the CECRA
Program.

General site features: Elevation 6780' , Slope 15°-25° ,
Aspect Southwest

Land use: Mining X , Recreational X , Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? 15 acres.

Dimensions: Approx. 800 feet x 800 feet

Predominant vegetation types: Lodgepole pine, fir

Access: roads - good X , poor , 4wd , trail .

Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Site is underlain by granodiorite; deposit
type is veins as fissure filling; Philipsburg Batholith; quartz
veins. Site lies above/in the headwaters area of Douglas Creek,
though drainages are all dry even with a wet spring. Surface water
leaving the site would flow to the southwest, and then west to
Douglas Creek.

Mining/milling history, ore type/tenor, host rock, gangue: Mine
began operating in 1882 and shut down in 1893. It reopened the
following year, shut down in 1905, and then reopened above the
Drain tunnel in Douglas Creek Canyon. Ore consists of a gangue of
quartz, rhodochrosite, rhodonite, barite, and calcite carrying
pyrite, arsenopyrite, stibnite, tetrahedrite, tennantite, galena,
sphalerite, ruby silver, realgar, and other minerals.

Mine Operation?

Shafts - Yes X, No , # 2, Comment Airshaft has grate;
open and could be
reactivated
Adits - Yes X, No , # ?, Comment Appears to be a few;
all caved
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three
questions:

Period(s) of Operation: 1882 to 1893; 1894 to 1905; unknown

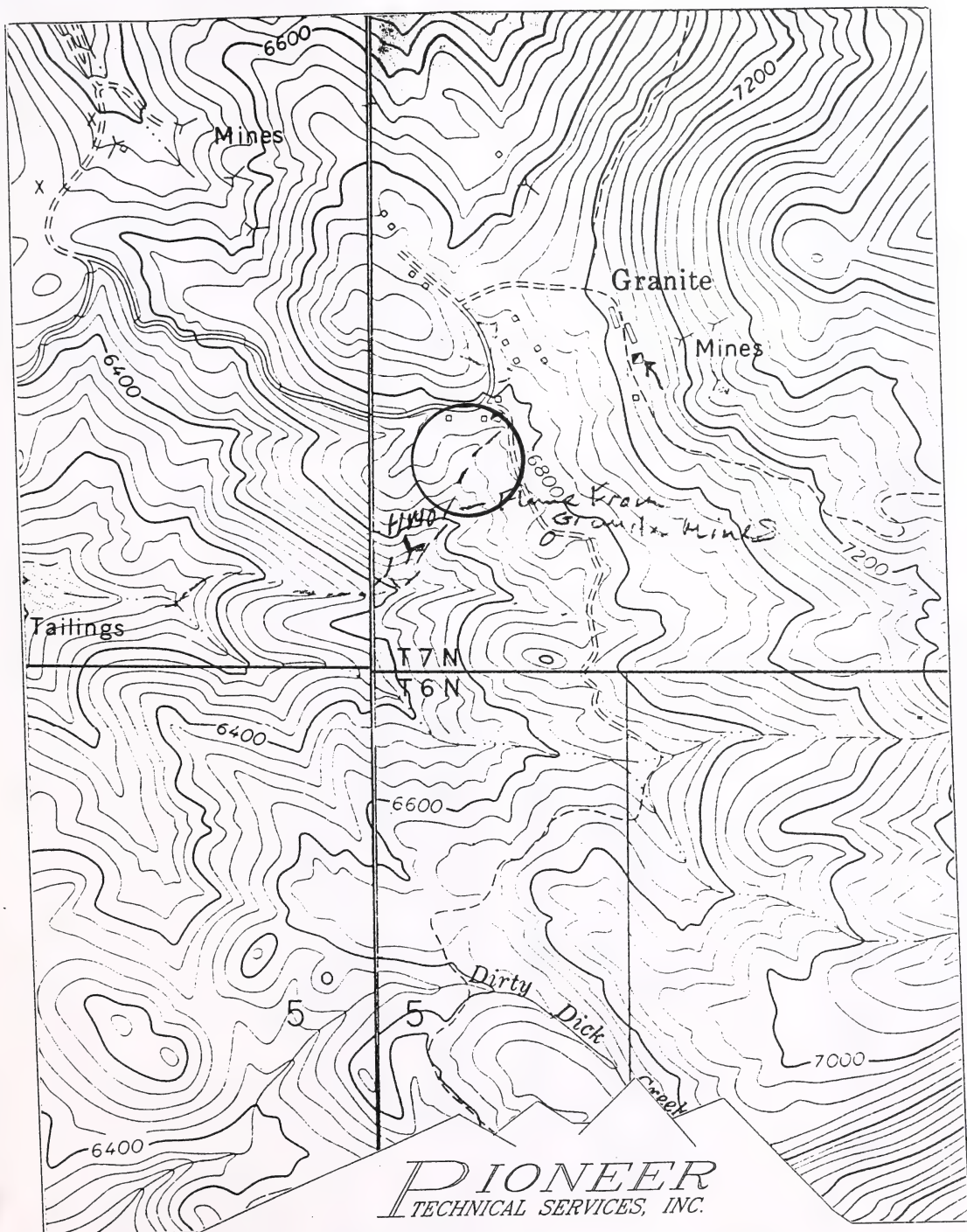
Origin of Ore Milled - Custom Mill Dedicated Mill X; Number and
names of mines that supplied mill feed: Possibly Granite Mountain

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Reported as a 100-stamp chloridizing roasting and pan amalgamation.
In early 1890s, combined 280 stamps at Granite Mountain and
Bimetallic. In 1893, a sulphite leaching plant and reworked a
portion of the tailings; a 300-ton concentrator plant was built per
1898. In 1906, an experimental cyanide plant may have been
installed at either Granite Mountain or this site to treat
tailings.

Montana Bureau of Mines and Geology
Water Well Log Data

10/22/1993

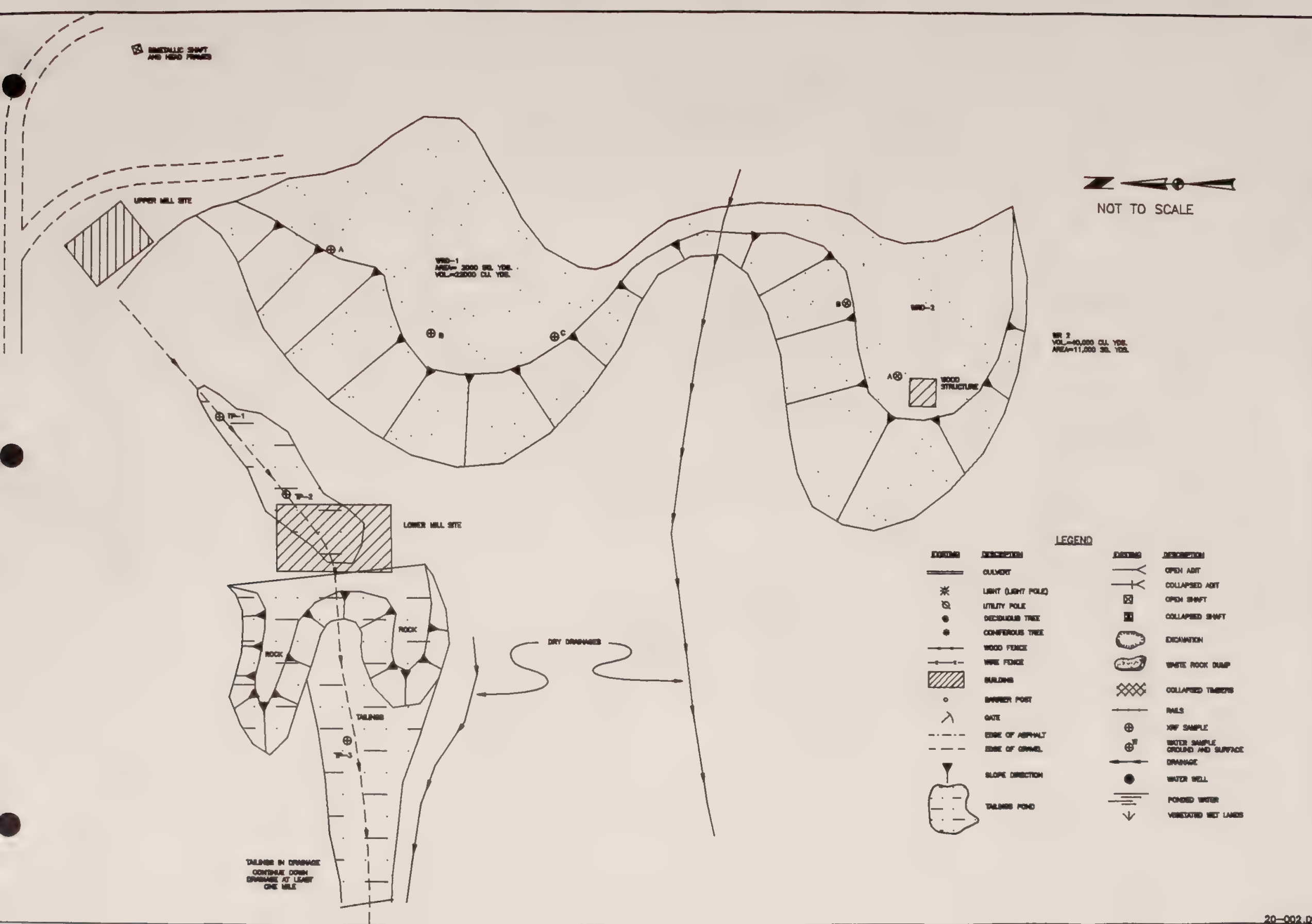
Well No.	Location	Depth	Yield	Static Water Level
M.55947	07N 13W 28 DBBB	9.0	11.0	4.00



BI-METALLIC/OLD RED, P.A. NO. 20-002

T07N, R13W, SECTION 36

SCALE: 1" = 1000'



NOT TO SCALE

VND-2
VOL=40,000 CU. YDS.
AREA=11,000 SQ. YDS.

VND-1
AREA= 3000 SQ. YDS.
VOL=22000 CU. YDS.

LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
o	UTILITY POLE	—	OPEN SHAF
•	DECIDUOUS TREE	—	COLLAPSED SHAF
•	CONIFEROUS TREE	—	EXCAVATION
—	WOOD FENCE	—	WHITE ROCK DUMP
—	WIRE FENCE	—	COLLAPSED TIMBERS
—	BUILDING	—	RAILS
—	BARRIER POST	—	XRF SAMPLE
>	GATE	—	WATER SAMPLE
---	EDGE OF ASPHALT	—	WATER SAMPLE
---	EDGE OF GRAVEL	—	GROUND AND SURFACE
—	SLOPE DIRECTION	—	DRAINAGE
—	TALING POND	—	WATER WELL
		—	PONDED WATER
		—	WETLANDS

TALING IN DRAINAGE
CONTINUE DOWN
DRAINAGE AT LEAST
ONE MILE

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

BI-METALLIC/OLD RED PA# 20-002
PHILIPSBURG DISTRICT GRANITE COUNTY

DRAWN: JTP DATE: 13 OCT 93
DESIGNED: JTR JOB NO: 93-17
APPROVED: JWS F.S. NO.

PIONEER
ENGINEERING

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPOKANE MONTANA WASHINGTON

TDSH

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Sands and silts; no impoundments

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): No impoundments; flumed down drainage.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundments

Comments on potential for mitigation: Tailings in drainage are self-revegetating. Some tails are still flowing down drainage and streambed below are seriously silted up.

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (MR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	22,000	Southeast of shaft with headframe on WR-1, northwest end	None	5.2 (D)	0.055	20-002-WR-1	06/22/93 1700	T-Metals, ABA
WR-1B	WR		Southeast of shaft with headframe on WR-1, center	None	6.4 (D)	0.05			
WR-1C	WR		Southeast of shaft with headframe on WR-1, southeast end	None	4.9 (D)	0.05			
WR-2A	WR	40,000	Dump farthest east, southwest end on top	None	3.8 (D)	0.055	20-002-WR-2	06/22/93 1700	T-Metals, ABA
WR-2B	WR		West of WR-2A, on southeast face	None	5.2 (D)	0.06			
TP-1	TAIL	Est. vol. of 40	Small pile within drainage; below mill with Ball Mill, north end of tailings	None	5.4 (D)	0.05	20-002-TP-1	06/22/93 1900	T-Metals, ABA
TP-2	TAIL		Small pile within drainage; just north of burned down mill	None	6.4 (D)	0.05			
TP-3	TAIL		Small pile within drainage; south of burned down mill, before creek	None	5.4 (D)	0.045			

*Direct reading (Alpha Beta); S-Saturated State (O2 in Water)

Comments or deviations from SOPs: 20-002-WR-1 is composite of WR-1A through -1C. 20-002-WR-2 is composite of WR-2A and -2B. 20-002-TP-1 is composite of TP-1 through -3. TP-1, -2, and -3 are not distinct ponds, but samples of floodplain/drainage tailings.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:_____

Filled shafts: Yes___, No X, Number:___ Identification:_____

Seeps/Springs: Yes___, No X, Number:___ Identification:_____

Groundwater wells within 4 miles?: Yes X, No___;
Number of well logs: 45

Distance to nearest well used for drinking? Approx. 1.5 to 2 miles to the town of Philipsburg.

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___, Possible X, Unlikely___.

Lack of buffering capacity of the soils; metal values, particularly arsenic, in dump are elevated; large uncontained source.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes ☐, No ☒, Name(s): _____

Dry streambeds: Yes ☒, No ☐, Name(s): Dry tributary, headwaters of Douglas Creek

Other surface water: Yes ☐, No ☒, Name(s)/Description: _____

Waste materials within any floodplain: Yes ☒, No ☐ Source ID(s): TP-1 and floodplain tails

Approximate Flood frequency? ☒ 1 yr, ☐ 10 yr, ☐ 100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow: _____, Average Flow: _____

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes ☐, No ☒, Describe: Possible during very high flow events.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Douglas Creek downstream, agriculture, possible residential.

Observed erosional/sedimentation/stream turbidity problems? Yes ☒, No ☐, Distance downstream (ft)? >2500 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Tailings downstream for at least 1/2 mile and into flowing surface water body (no name); stream has serious silt build up.

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 1 acre

Wetlands present: Yes , No X, Describe:

Carbonate rocks/soils: Yes , No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 ;
100-300 ; 300-1,000 ; 1,000-3,000 X; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
 observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Belanger

[illegible]

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X, Describe: _____

Population within 1 mile: 1-10____; 10-30____; 30-100____; 100-300____; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____; Comments None

Evidence of recreational use on site: Yes X, No____, Describe: Tourist place

Accessibility - Fences, warning signs, closed roads? Gate - unlocked

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes____, No X, Comment_____
Wilderness Area - Yes____, No X, Comment_____
T&E Species Habitat - Yes X, No____, Comment Bald Eagle
Bat Habitat - Yes____, No X, Comment_____

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality - High____, Medium X, Low____
Wetlands Frontage - High____, Medium X, Low____
Fisheries Habitat and Species Classification - 1
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes____, No X, Number____, types and locations:_____

Hazardous structures: Yes____, No X, Number____, types and locations:_____

Unstable highwalls, pits, trenches, slopes: Yes____, No X, Number____, types and locations:_____

Unstable waste piles, impoundments, undercut banks: Yes X, No____, Number____, types and locations: Waste piles at angle of repose.

Fire and/or Explosion hazards: Yes____, No X, Explain:_____

Bibliography

MBMG, Bi-Metallic, Granite County, Form 39, 1968-1978.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle, Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Maps, Fred Burr Lake/Philipsburg, Montana, 7 1/2 minute Quadrangles, 1971.

LABORATORY ANALYTICAL DATA

BI-METALLIC/OLD RED
PA NO. 20-002

Bimetallic/Old Red PA# 20-002
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/22/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-002-TP-1	3270	201	3.2	2.4	2.3	126 J	18100	1.5	3760	15 J	667 J	112 J	469	0.292 U
20-002-WR-1	8230 J	108	0.6 U	1.8	1.1	32.4	26900	0.801 JX	179	2 U	386	79 J	387	NR
20-002-WR-2	2860	114	1.7	3.9	2.8	72.5 J	20200	2.02	2200	12 J	413 J	78 J	568	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	NEUTRAL ACID BASE POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE 1/1000	SULFUR ACID BASE POTENT. 1/1000
20-002-TP-1	0.19	5.94	-0.3	0.12	<0.01	0.07	0	5.62
20-002-WR-1	0.74	23.1	-2.0	0.59	0.01	0.14	0.31	-2.36
20-002-WR-2	1.17	36.6	5.19	0.32	0.62	0.23	19.4	-14.2

LEGEND

TP1 - Composite of subsamples TP1, 2, and 3.

WR1 - Composite of subsamples WR1A, 1B, and 1C.

WR2 - Composite of subsamples WR2A and 2B.

BACKGROUND - From the Granite Mountain Mine (20-110-SS1)

XRF ANALYSIS RESULTS

**BI-METALLIC/OLD RED
PA NO. 20-002**

XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-002-SS-1	135.825	13126.2	11529.3	2799.27	118.454 *	1964.17	25663.1			153.399 *	70.568 *	332.236
20-002-TP-1	141.51	21378.1	4091.76	1184.34		6973.32	18982		107.516 *	393.358	2940.73	246.105
20-002-TP-1-COMP	130.524	18983.4	3638.31	1098.89		3125.24	17660.6			374.31	3148.04	226.305
20-002-TP-2	86.7304	25928.5	3943.7	1644.8		862.761 *	19182.2			216.677	3868.14	249.22
20-002-TP-3	236.72	22109.1	4617.57	2004.63		1102.06 *	30145.9		102.348 *	481.162	4844.94	284.995
20-002-WR1-A	107.792	19917.2	7134.06	1805.13		425.913 *	45364.8			109.76 *	11520.7	341.46
20-002-WR1-B	195.245	20659.1	3159.47	2445.32		1170.84 *	39425.3			247.035	5885.41	358.042
20-002-WR1-C	113.261	25971.2	17945.7	1213.72			26586.2			87.9578 *	6303.64	353.342
20-002-WR2-A	73.349	19256.5	12354.8	1070.04		8367.92	24812.3		146.758 *	1251.06	4326.81	257.481
20-002-WR2-B	144.764	24786	2564.19	1152.13	113.637 *		34502.1			126.617 *	4110.01	299.599
20-002-WR1-COMP	139.76	22352.8	9203.83	1716.52	120.89 *	480.142 *	38298			147.797 *	8172.03	350.782
20-002-WR-2-COMP	107.225	23898.4	9467.88	1701.05		2969.84	28562.2		63.073 *	681.738	3875.78	265.793
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-002-SS-1	135.825			425.706	79.3954		212.428	627.999	101.571 *	13.0172 *		
20-002-TP-1	141.51			649.504	106.57		228.294	595.59	94.1151 *			
20-002-TP-1-COMP	130.524			325.747	107.51		233.88	510.439	114.476 *			
20-002-TP-2	86.7304			1133.23	141.715		342.773	548.896	228.371 *	15.7768 *		
20-002-TP-3	236.72			229.865	120.307		214.985	658.255	135.172 *			
20-002-WR1-A	107.792			451.334	125.268		310.062	447.782	136.201 *			
20-002-WR1-B	195.245			294.706	131.025		181.792 *	607.137	110.849 *			
20-002-WR1-C	113.261			574.92	176.825		384.641	301.558	221.606			
20-002-WR2-A	73.349			309.3	119.429		185.619	459.984	193.639 *			
20-002-WR2-B	144.764			296.841	176.339		226.161	708.882	128.428 *			
20-002-WR1-COMP	139.76			441.359	157.797		245.767	424.955	175.411 *	17.2996 *		
20-002-WR-2-COMP	107.225				164.145			459.447				

* - Estimated Quantity

\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

BI-METALLIC/OLD RED
PA NO. 20-002

AIMSS SCORESHEET

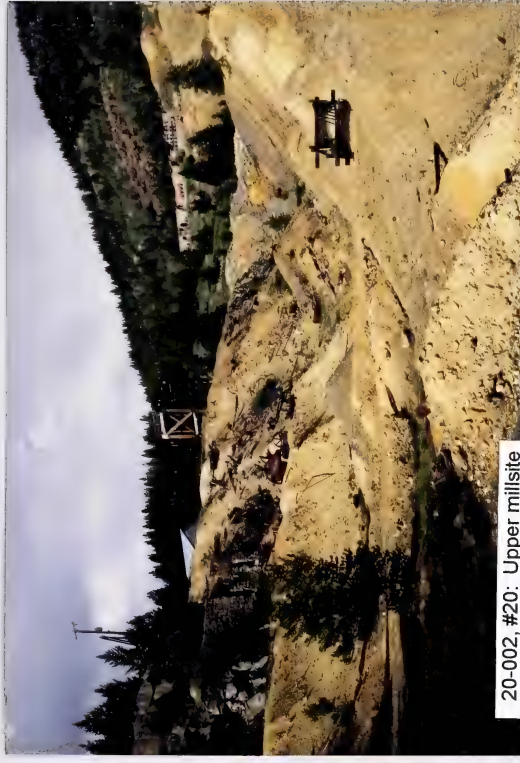
SITE NAME: BI-METALLIC/OLD RED
PA NUMBER: 20-002

LINE NO.				
1		GROUNDWATER PATHWAY		
2		OBSERVED RELEASE		0
3A	GW - LIKELIHOOD	EXCEEDENCES		0
3B	OF RELEASE	CONTAINMENT		20
3C		GW DEPTH		10
4		POTENTIAL TO RELEASE	LINES 3A x 3B	200
5		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
6	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	186.229
7		WELLS - 1 MI. x 2.5		2.5
8	GW - TARGETS	WELLS - 1 TO 4 MI		44
9		NEAREST WELL		0
10		TARGETS SCORE	LINES 6 + 7 + 8	46.5
		GROUNDWATER SCORE	LINES 4 x 5 x 9	1731930
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD	EXCEEDENCES		0
13A	OF RELEASE	CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	188.413
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		3
18		WETLANDS		10
19	SW - TARGETS	FISHERY		20
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	45
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	3391434
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD	CONTAINMENT		15
26B	OF RELEASE	DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.250
29		POPULATION - 4 MILES		1000
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	1015
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	95156
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF	ACCESSIBILITY		10
37B	EXPOSURE	DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.238
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 - 42	10
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	1238
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			
	(LINES 10 + 24 + 35 + 44) / 100,000			52.20

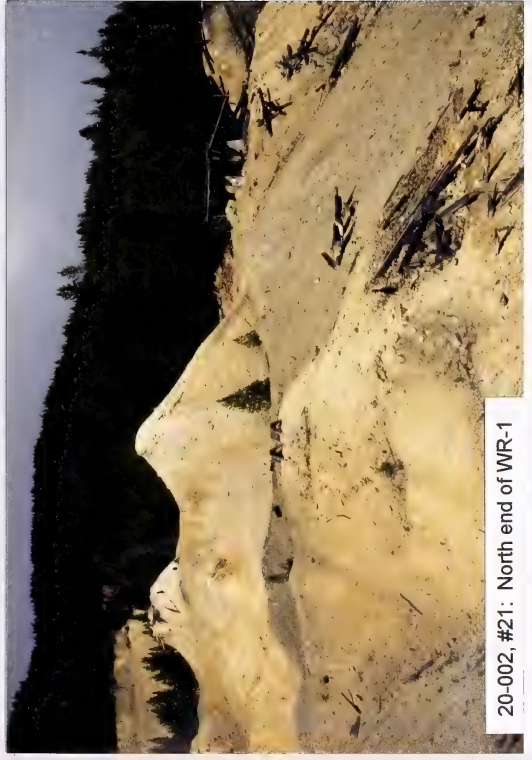
LINE NO.			SITE NAME:	BI-METALLIC/OLD RED
			PA NUMBER:	20-002
	SITE SAFETY			
1	THREAT	ACCESSIBILITY		10
2	HAZARDS	OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4		UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9	TARGETS	POPULATION - 1 MILE		0
10		NEAREST RESIDENCE		0
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 - 11	10
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000	0.00



20-002, #19: Bi-Metallic shaft and buildings



20-002, #20: Upper millsite



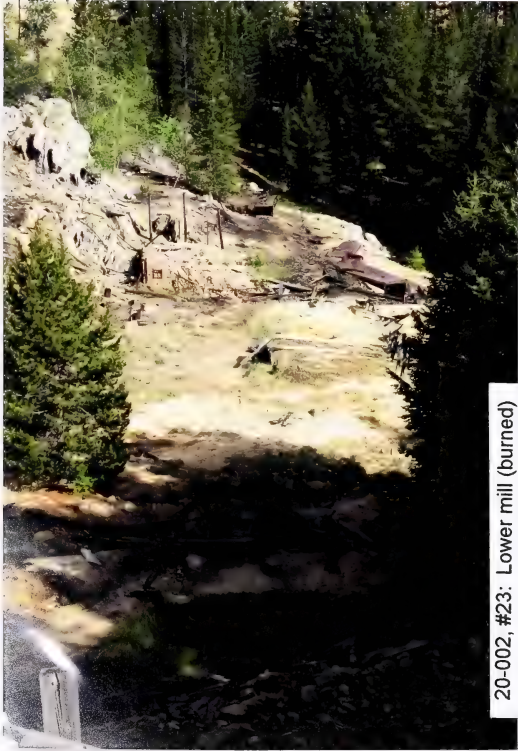
20-002, #21: North end of WR-1



20-002, #22: WR-2 (behind trees)



20-002, #24: Mill and drainage used for fluming tails



20-002, #23: Lower mill (burned)

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: DOUGLAS CREEK PA#: 20-003

Date: June 23, 1993 Time: 0800

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer
Lasher, Pioneer

Visitors: Off-road vehicle rider

Weather/Seasonality Observations: Cold; intermittent snow showers; light winds.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #20: TP-2; #21: SW-1 sample location upstream; #22: TP-2B, profile of hole; #23: SW-2 and SE-2 sample locations downstream of TP-2; #24: Sluffing of tailings from TP-1 into Douglas Creek; #25: SW-3 and SE-3 sample locations downstream of TP-1; #26: Stream through TP-1 looking east; #27: TP-1; #28: TP-1A; #29: TP-1B; #30: Water pipe and patch in TP-1. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms): Very large volume of waste material.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove tailings from active drainage, construct stabilized channel, grade, amend, and revegetate tailings.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): DOUGLAS CREEK PA#: 20-003

Legal Description: T 7N ; R 13W ; Sec. 31 , SE 1/4 SE 1/4 1/4

County: GRANITE Mining District: PHILIPSBURG

Latitude: N 46° 18' 38" Longitude: W 113° 15' 50"

Primary Drainage Basin and Code: Flint Creek/17010202

Secondary Drainage Basin: Douglas Creek

USGS Quadrangle map name(s): Philipsburg

Mine Type/Commodities: Tailings/Gold, Silver, Lead

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Hope Resources, Box 791, Butte, MT 59702. (406) 443-2510.

Relationship to other mines/sites in the area/district: Source of the majority of the tailings is the Bi-Metallic and Granite Mountain Mills via wooden flumes.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? The Philipsburg district is currently listed under the CECRA Program.

General site features: Elevation 5680'-6040' , Slope 10° , Aspect Northwest

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ , Agricultural ☐ , Other (Specify) ☐

Area of disturbed/unvegetated lands? Approx. 7 acres.
Dimensions:

Predominant vegetation types: Lodgepole pine, Douglas fir, aspen, spruce, pine grass, wheat grass, snake grass

Access: roads - good ☐ , poor ☐ , 4wd ☒ , trail ☐ .
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBWG Well Log Printout(s)): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies within the Douglas Creek drainage; water flows under the site in culverts in a westerly direction. Douglas Creek is marked as an intermittent stream on the topographic map.

Mining/milling history, ore type/tenor, host rock, gangue: Mine began operating in 1882 and shut down in 1893. It reopened the following year, shut down in 1905, and then reopened above drain tunnel in Douglas Creek Canyon. Ore consists of a gangue of quartz, rhodochrosite, rhodonite, barite, and calcite carrying pyrite, arsenopyrite, stibnite, tetrahedrite, tennantite, galena, sphalerite, ruby silver, realgar, and other minerals.

Mine Operation?

Shafts - Yes , No X, # , Comment
Adits - Yes , No X, # , Comment
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three questions:

Period(s) of Operation: Mills at Bi-Metallic and Granite Mountain operated in early 1900s.

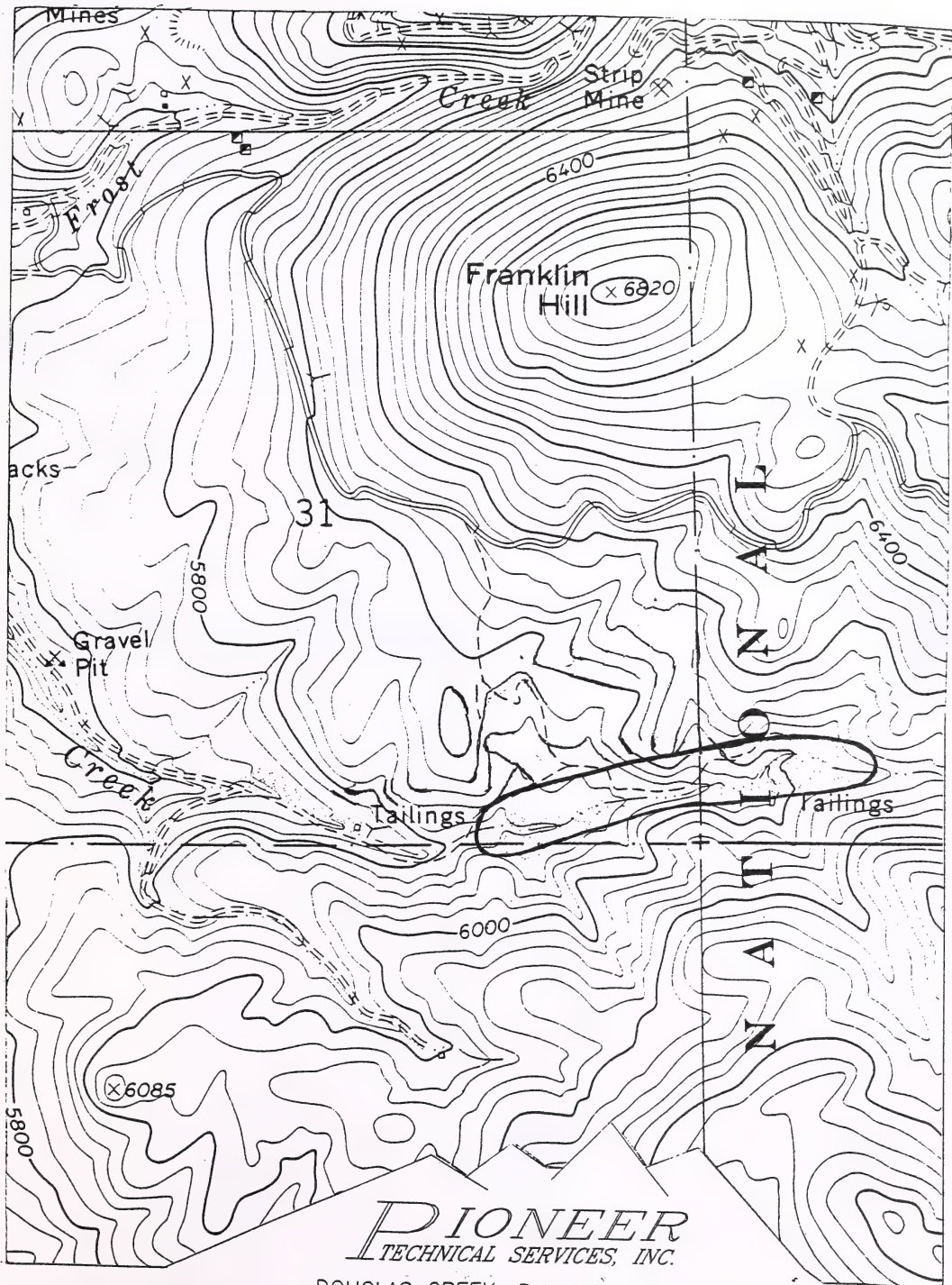
Origin of Ore Milled - Custom Mill Dedicated Mill X; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
Floatation

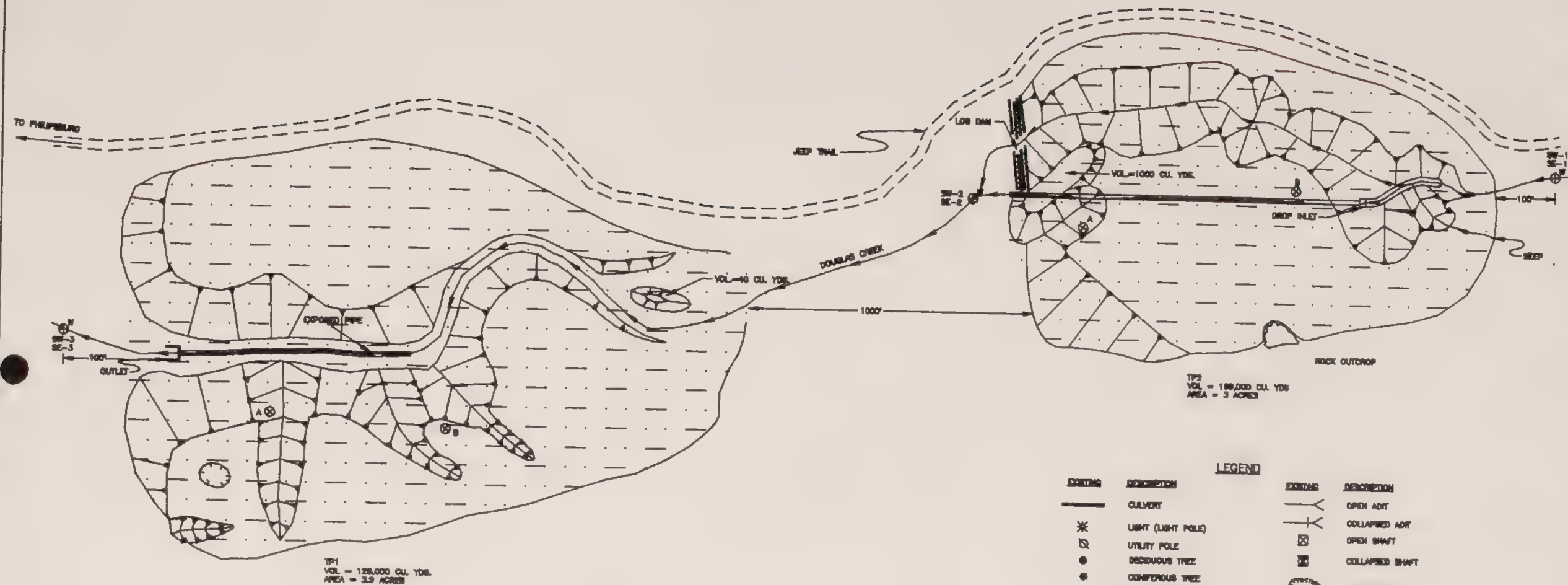
Montana Bureau of Mines and Geology
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
N:33641	06N 14W 36 AACD	9.0	15.0	7.00
M:53642	06N 14W 36 ABCB	9.0	15.0	7.00



PIONEER
 TECHNICAL SERVICES, INC.
 DOUGLAS CREEK, P.A. NO. 20-003
 T07N, R13W, SECTION 31
 SCALE: 1" = 1000'



NOT TO SCALE

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
•	UTILITY POLE	—	OPEN SHAFT
•	DECIDUOUS TREE	—	COLLAPSED SHAFT
•	CONIFEROUS TREE	—	EXCAVATION
—	WOOD FENCE	—	WHITE ROCK CLAMP
—	WIRE FENCE	—	COLLAPSED TIMBERS
—	BUILDING	—	RAILS
•	BARRIER POST	—	SOIL SAMPLE
—	GATE	—	XRF SAMPLE
—	EDGE OF ASPHALT	—	WATER SAMPLE
—	EDGE OF GRAVEL	—	GROUND AND SURFACE DRAINAGE
—	SLOPE DIRECTION	—	WATER WELL
—	TAILINGS POND	—	PONDED WATER
		—	VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

DOUGLAS CREEK PA# 20-003
PHILIPSBURG DISTRICT GRANITE COUNTY

DRAWN: JTP DATE: 9 DEC 93
DESIGNED: TDR JOB NO. 93-17
APPROVED: INR F.S. NO.

PIONEER
ENGINEERING CONSULTANTS

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS—BOZEMAN—KALISPELL
SPokane MONTANA WASHINGTON

SHEET NO.

20-003.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay):
Generally medium sand or silty sand

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): TP-1 had an oxidized and reduced zone, while TP-2 appeared to be completely oxidized.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments):
Partially wet along stream

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Breached and severely eroding

Comments on potential for mitigation: Stabilize and revegetate unless metals concentrations are increasing in surface water. Feasibility study is necessary.

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Flammang, Lasher*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
TP-1A-A	TAIL	126,000	West end of downstream dam, profile; 1.5'-2.5'	Breached	6.0 (D)	0.03	20-003-TP-1A	06/23/93 2355	T-Metals, ABA, Cation Exchange
TP-1A-B	TAIL		West end of downstream dam, profile; 5'-6.5'	Breached	6.0 (D)	0.03			
TP-1A-C	TAIL		West end of downstream dam, profile; 10'-11'	Breached	5.5 (D)	0.04			
TP-1A-D	TAIL		West end of downstream dam, profile; 15'-16'	Breached	5.9 (D)	0.03			
TP-1A-E	TAIL		West end of downstream dam, profile; 20'-22'	Breached	6.1 (D)	0.03			
TP-1B-A	TAIL		East central auger hole; 0.25'-4'	Breached	7.0 (D)	0.03	20-003-TP-1B	06/23/93 1345	T-Metals, ABA, Cation Exchange
TP-1B-B	TAIL		East central auger hole; 4'-5'	Breached	6.6 (D)	0.02			
TP-1B-C	TAIL		East central auger hole; 5'-10'	Breached	7.0 (D)	0.025			
TP-1B-D	TAIL		East central auger hole; 10'-14'	Breached	6.0 (D)	0.03			
TP-2A-A	TAIL	169,000	West end of upstream dam, profile; 0'	Breached	6.6 (D)	0.07	20-003-TP-2A	06/23/93 1410	T-Metals, ABA, Cation Exchange
TP-2A-B	TAIL		West end of upstream dam, profile; 10'	Breached	6.5 (D)	0.05			
TP-2A-C	TAIL		West end of upstream dam, profile; 20'	Breached	5.6 (D)	0.07			
TP-2A-D	TAIL		West end of upstream dam, profile; 30'	Breached	6.6 (D)	0.05			
TP-2A-E	TAIL		West end of upstream dam, profile; 40'	Breached	6.5 (D)	0.04			
TP-2A-F	TAIL		West end of upstream dam, profile; 50'	Breached	6.6 (D)	0.05			

*B-Silent feeding (feeding block); S-Saturated Phase (Oxide Meter)

Comments or deviations from SOPs: 20-003-TP-1A is composite of TP-1A-A through -1A-E.
20-003-TP-1B is composite of TP-1B-A through -1B-D. 20-003-TP-2A is composite of TP-2A-A through -2A-F.

*Continued on next page.

SOURCE INVENTORY FORM (Cont'd)

SAMPLERS: Bullock, Flammang, Lasher

[illegible]

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-003-TP-2B-A is composite of TP-2B-A and -2B-B.
20-003-TP-2B-B is composite of TP-2B-C and -2B-D.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:_____

Filled shafts: Yes___, No X, Number:___ Identification:_____

Seeps/Springs: Yes X, No___, Number: 1 Identification: Seep located upgradient of TP-2

Groundwater wells within 4 miles?: Yes X, No___;
Number of well logs: 69

Distance to nearest well used for drinking? Approx. 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___, Possible X, Unlikely___.

Contamination levels may be minimal due to the carbonate materials present.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Douglas Creek

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): TP-1 and TP-2

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)?

High Flow: 5 cfs, Average Flow: 0.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; tailings actively eroding into the creek.

Surface water draining onto or through waste sources: Yes X, No ,
Describe: Pipes and flumes have been constructed to route water through the tailings, but have failed.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Douglas Creek discharges to Flint Creek - irrigation, stock watering, fishery, wetlands, Bald eagle habitat.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No , Distance downstream (ft)? >1000 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Tailings in sediments down to next mine; tailings dams have breached and very large volumes have eroded away.

SAMPLERS: Bullock, Flammang

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Some available area for re-grading the tailings; also, approx. 1000'x100' of area between TP-1 and TP-2.

Wetlands present: Yes X, No , Describe: Approx. 4 acres of wetlands between TP-2 and TP-1; stream below TP-1 steeper gradient with little wetlands area available.

Carbonate rocks/soils: Yes X, No , Describe: Limestone is abundant in the area.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 ; 100-300 ; 300-1,000 X; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ; Comments

Nearest residence(ft or miles)? Approx. 1 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:

observed high moderate low none

SAMPLERS: Bullock, Flammanq, Lasher

[illegible]

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes ☐, No ☒, Describe: _____

Population within 1 mile: 1-10 ☒; 10-30 ☐; 30-100 ☐; 100-300 ☐; 300-1,000 ☐; 1,000-3,000 ☐; 3,000-10,000 ☐; 10,000 or greater ☐; Comments _____

Evidence of recreational use on site: Yes ☒, No ☐, Describe: Off-road vehicle tracks; litter; poker ride signs posted; ATV rider on-site during this investigation.

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <input type="checkbox"/> , No <input checked="" type="checkbox"/> , Comment _____
Wilderness Area -	Yes <input type="checkbox"/> , No <input checked="" type="checkbox"/> , Comment _____
T&E Species Habitat -	Yes <input checked="" type="checkbox"/> , No <input type="checkbox"/> , Comment <u>Bald Eagle</u>
Bat Habitat -	Yes <input type="checkbox"/> , No <input checked="" type="checkbox"/> , Comment _____

Primary Drainage ☐; Secondary Drainage ☒; No Information ☐:

Riparian Habitat Quality - High ☐, Medium ☒, Low ☐
Wetlands Frontage - High ☐, Medium ☒, Low ☐
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes ☒, No ☐, Number 1, types and locations: One adit located approx. 1/4 mile northeast of TP-2.

Hazardous structures: Yes ☐, No ☒, Number ☐, types and locations: _____

Unstable highwalls, pits, trenches, slopes: Yes ☒, No ☐, Number 2, types and locations: Both ponds had unstable slopes down to stream.

Unstable waste piles, impoundments, undercut banks: Yes ☒, No ☐, Number 2, types and locations: Both dams are breached.

Fire and/or Explosion hazards: Yes ☐, No ☒, Explain: _____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Douglas Creek, Prepared by Northern Engineering and Testing, September 28, 1987.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle, Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Map, Philipsburg, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

DOUGLAS CREEK
PA NO. 20-003

Douglas Creek PA# 20-003
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/23/93

SOLID MATRIX ANALYSES

Results per dry weight basis

Metals in soils

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-003-SE-1	900	136	3.3	5.5	2.8	95.1 J	12300	22.5	3030	14 J	390 J	46 J	763	NR
20-003-SE-2	1260	128	2.3	5.1	4.1	75.1 J	13400	3.84	3390	13 J	403 J	81 J	535	NR
20-003-SE-3	2140	265	4.7	7	6.4	129 J	18500	3.78	10600	44 J	535 J	135 J	1030	NR
20-003-TP-1A	3710	491	5.7	2.4	4.5	181 J	13700	16.4	13700	56 J	1430 J	224 J	2030	NR
20-003-TP-1B	2710	274	3.8	1.4 U	2.7	75.1 J	8360	3.17	11500	44 J	556 J	186 J	985	NR
20-003-TP-2A	2140	146	2.7	3.7	3.5	118 J	14700	1.06	4270	18 J	602 J	125 J	464	NR
20-003-TP-2BA	1520	185	2.4	3.4	3.5	63.1 J	13700	1.52	4270	16 J	336 J	115 J	496	NR
20-003-TP-2BB	2950	309	4	2.7	3.8	148 J	20400	1.44	7050	27 J	974 J	156 J	817	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

Acid/Base Accounting

Cation Exchange Capacity

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR u/1000x	ACID BASE u/1000x	POTENT. u/1000x	NEUTRAL u/1000x	SULFUR u/1000x	ACID BASE u/1000x	POTENT. u/1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR u/1000x	ACID BASE u/1000x	POTENT. u/1000x	milliequivalents/100g
20-003-TP1A	0.29	9.06	9.06	37.5	28.4	0.05	0.16	0.08	5	32.5	4.05	3.44	23.1	4.05
20-003-TP1B	0.29	9.06	26.5	17.4	0.13	0.05	0.05	0.05	0.31	5.93	3.38	0.31	13.5	3.38
20-003-TP2A	0.18	5.62	6.24	14.4	11	0.02	0.03	0.06	0.94	13.5	3.13	0.94	13.8	3.13
20-003-TP2B-A	0.11	3.44	14.4	15.6	3.75	0.26	0.06	0.06	1.87		5.22			5.22
20-003-TP2B-B	0.38	11.9												

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Results in ug/L

Metals in Water

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC
20-003-SW-1	24.3	28.5	2.57 U	9.7 U	6.83 U	5.43	63.7	0.11	16.1	12.7 U	1.33	30.7 U	51.9	24.3
20-003-SW-2	72.2	28.2	2.57 U	9.7 U	6.83 U	5.9	270	0.25	557	12.7 U	4.1	30.7 U	115	29.1
20-003-SW-3	87.4	25.3	2.57 U	9.7 U	6.83 U	6.37	316	0.17	807	12.7 U	5.55	30.7 U	249	33.1

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-003-SW-1	81	< 5.0	10	< 0.05	NR
20-003-SW-2	95	< 5.0	15	< 0.05	NR
20-003-SW-3	98	< 5.0	20	0.06	NR

LEGEND

SE1 - Located approx. 100' upstream from the east end of tailings pond 2.
SE2 - Approx. 70' downstream of tailings pond 2, below confluence of two stream channels.
SE3 - Approx. 100' below tailings pond 1.
TP1A - Composite of subsamples TP1A-A through 1A-E.
TP1B - Composite of subsamples TP1B-A through 1B-D.
TP2A - Composite of subsamples 2A-A through 2A-F.
TP2B-A - Composite of subsamples TP2B-A and 2B-B.
TP2B-B - Composite of subsamples TP2B-C and 2B-D.
BACKGROUND - From the Granite Mountain Mine.
SW1 - Same as sample SE1.
SW2 - Same as sample SE2.
SW3 - Same as sample SE3.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

XRF ANALYSIS RESULTS

**DOUGLAS CREEK
PA NO. 20-003**

* - Estimated Quantity
\$ - Unvalidated Data



**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**DOUGLAS CREEK
PA NO. 20-003**

AIMSS SCORESHEET
 SITE NAME: DOUGLAS CK. TAILINGS
 PA NUMBER: 20-003

LINE NO.			PA NUMBER:	20-003
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	729.578
6		WELLS - 1 MI. x 2.5		5.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		67
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	72.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	21011846
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	747.318
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	23
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	13750651
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.396
29		POPULATION - 4 MILES		300
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	315
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	32981
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.363
40	DIRECT CONTACT	POPULATION - 1 MILE		1
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 - 42	11
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	2249
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			347.98

SITE NAME: DOUGLAS CK. TAILINGS
 PA NUMBER: 20-003

LINE NO.	SITE SAFETY		
1	THREAT	ACCESSIBILITY	20
2	HAZARDS	OPEN SHAFTS	100 EA.
3		OPEN ADITS	50 EA.
4		UNSTAB. HIWALLS / PITS	75 EA.
5		HAZ. STRUCTURES	40 EA.
6		EXPLOSIVES	0
7		HAZ. MATERIALS	0
8		HAZARDS SCORE	SUM LINES 2 - 7
9	TARGETS	POPULATION - 1 MILE	200
10		NEAREST RESIDENCE	1
11		RECREATIONAL USE	0
12		TARGETS SCORE	10
13		SITE SAFETY SCORE	SUM LINES 9 - 11
			(LINES 1 x 8 x 12) / 1,000
			44.00



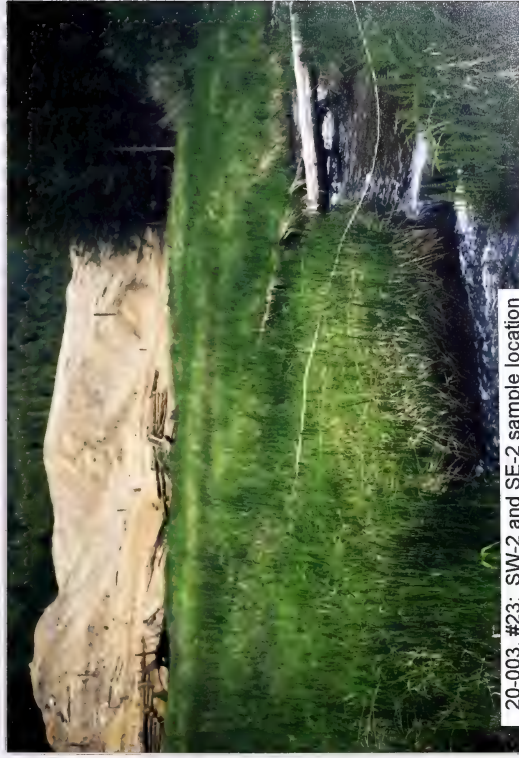
20-003, #20: TP-2



20-003, #21: SW-1 and SE-1 sample location



20-003, #22: Profile of auger hole on TP-2B



20-003, #23: SW-2 and SE-2 sample location



20-003, #24: Caving of tailings from TP-1 into creek



20-003, #25: SW-3 and SE-3 sample location



20-003, #26: Stream through TP-1, facing east



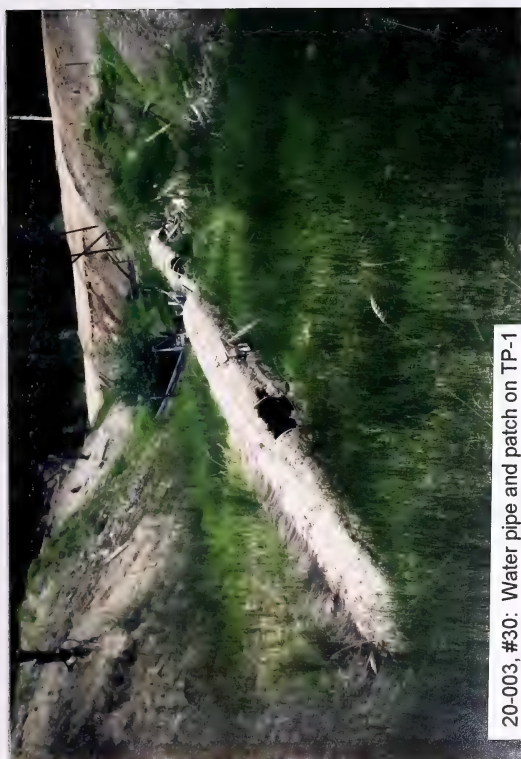
20-003, #27: TP-1



20-003, #29: TP-1B XRF sample location



20-003, #28: TP-1A XRF sample location



20-003, #30: Water pipe and patch on TP-1

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ALGONQUIN PA#: 20-005

Date: June 23, 1993 Time: 0900-1530

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Cool; windy; occasional snow;
cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: SE/SW-2
location; #2: Mine site view; #3: WR-5 (adit); #4: WR-4; #5: WR-3
(shaft); #6: WR-2 east half; #7: WR-2 west half; #8: WR-1.
No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms):
Access to site was by truck. Waste rock dumps are slightly
vegetated.

Other Hazardous Materials/Substances Present: Asbestos present on
boiler.

General Comments on Potential Remedial Alternatives: Close shaft;
revegetate dumps.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ALGONQUIN PA#: 20-005

Legal Description: T 7N ; R 13W ; Sec. 30 , SE 1/4 SE 1/4 1/4

County: GRANITE Mining District: PHILIPSBURG

Latitude: N 46° 19' 40" Longitude: W 113° 15' 57"

Primary Drainage Basin and Code: Douglas Creek/17010202

Secondary Drainage Basin: Frost Creek

USGS Quadrangle map name(s): Philipsburg

Mine Type/Commodities: Hardrock/Silver, Gold, Lead, Zinc, Manganese

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Granite Resource, 1029 Choteau, Helena, MT 59601. (406) 443-2510.

Relationship to other mines/sites in the area/district: Initially owned and operated by the same company as the Trout mine and has similar ore type.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? Shaft has been fenced by DSL. The Philipsburg district is currently listed under the CECRA Program.

General site features: Elevation 6000' , Slope 23° ,
Aspect Southeast

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ ,
Agricultural ☐ , Other (Specify) _____

Area of disturbed/unvegetated lands? 6 acres.

Dimensions: _____

Predominant vegetation types: Lodgepole pine, fir

Access: roads - good ☒ , poor ☐ , 4wd ☐ , trail ☐ .

Other logistical considerations (proximity to other sites). Over the divide from the Trout complex.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There are 7 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Site is underlain by the limestone of the
Hasmak Formation. The veins cut across bedding plains. Site lies
adjacent to the south side of intermittent Frost Creek. Frost
Creek flows west through the site, then west-southwest to its
confluence with Douglas Creek (also intermittent) approx. 1 1/4
miles below the mine.

Mining/milling history, ore type/tenor, host rock, gangue: Site
was worked from 1878 to 1882 for Ag; mined in 1916 for Mn. From
1916 to 1918 inclusive produced 55,000 tons of Mn ore. Oxidized
ore averaged 40-45% Mn, 16% or less silica, and 1.5% iron; Non-
oxidized carried 30-40% Mn, 20% or more silica, and 1.5% iron.
In 1913, ore on the dumps consisted of quartz gangue stained with
iron and manganese oxides, also lead carbonates, pyromorphite, and
galena.

Mine Operation?

Shafts - Yes X, No , # 1, Comment Fenced
Adits - Yes X, No , # 4, Comment All caved
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes , No X. If yes answer the next three
questions:

Period(s) of Operation: N/A

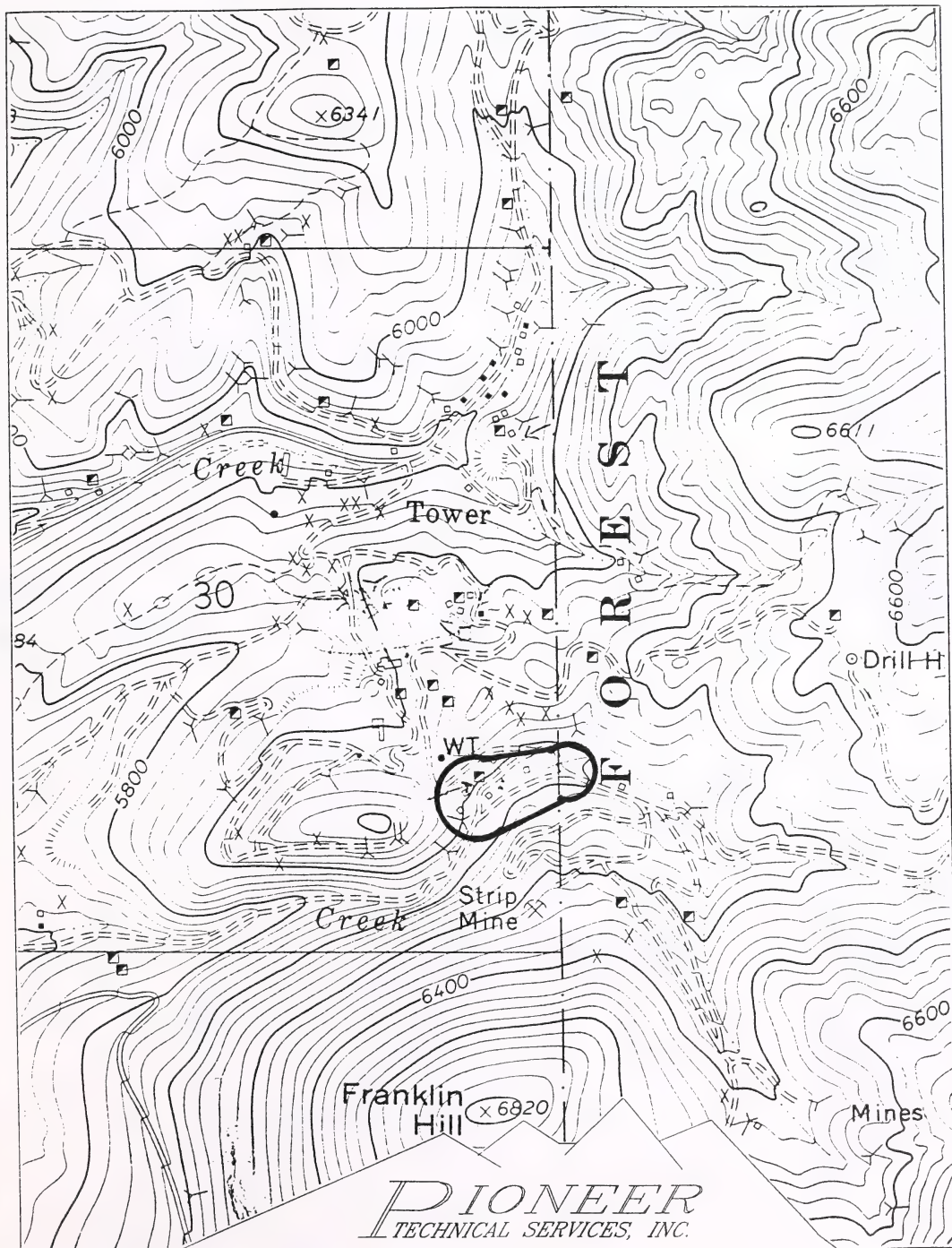
Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

10/22/1993

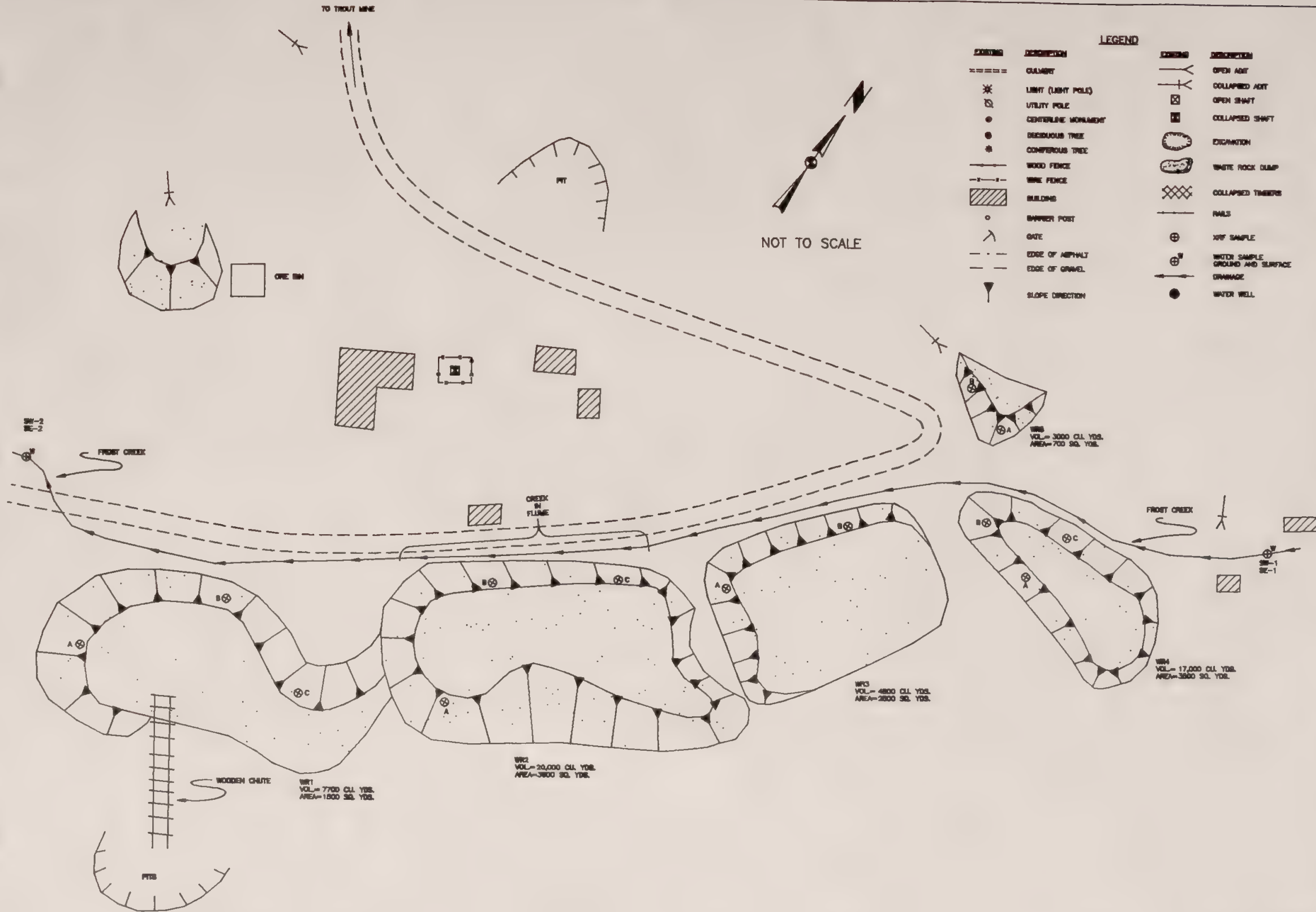
Well No.	Location	Depth	Yield	Static Water Level
M:55960	07N 14W 25	192.0	0.0	0.00
M:55961	07N 14W 25	35.0	20.0	0.00
M:55980	07N 14W 36 BA	90.0	0.0	38.00
M:55981	07N 14W 36 BADD	125.0	0.0	0.00
M:55982	07N 14W 36 CA	40.0	7.0	20.00
M:55983	07N 14W 36 CACC	68.0	20.0	48.00
M:55984	07N 14W 36 CC	48.0	4.0	11.00



ALGONQUIN, P.A. NO. 20-005

T07N, R13W, SECTION 30

SCALE: 1" = 1000'



PIONEER
ENGINEERING CONSULTANTS

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPOKANE

DRAWN: JTP DATE: 11 OCT 83
DESIGNED: JTP JOB NO.: 93-17
APPROVED: JTP F.B. NO.:
F.B. NO.:

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

ALGONQUIN PA# 20-005

PHILIPSBURG DISTRICT GRANITE COUNTY

TDS&H

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Belanger, Clark

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (Yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)*	RADIO-ACTIVITY (MR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	7,700	Western large dump; west side	None	4.9 (D)	0.04	20-005-WR-1	06/23/93 1440	T-Metals, ABA
WR-1B	WR		Western large dump; north side	None	6.6 (D)	0.035			
WR-1C	WR		Western large dump; east side	None	5.6 (D)	0.05			
WR-2A	WR	20,000	Next dump east of WR-1; south side	None	5.8 (D)	0.04			
WR-2B	WR		Next dump east of WR-1; northwest side	None	< 3.5 (D)	0.05			
WR-2C	WR		Next dump east of WR-1; northeast side	None	< 3.5 (D)	0.04			
WR-3A	WR	4,800	Dump immediately east of WR-2; west side	None	< 3.5 (D)	0.04	20-005-WR-2	06/23/93 1450	T-Metals, ABA
WR-3B	WR		Dump immediately east of WR-2; north side	None	4.2 (D)	0.035			
WR-4A	WR	17,000	Eastern dump; south side, near middle	None	5.2 (D)	0.045	20-005-WR-3	06/23/93 1500	T-Metals, ABA
WR-4B	WR		Eastern dump; just off west end of knob	None	4.8 (D)	0.05			
WR-4C	WR		Eastern dump; north side, near middle	None	4.8 (D)	0.05			
WR-5A	WR	3,000	Dump on north side of creek; off knob on south end	None	5.7 (D)	0.035	N/A	N/A	XRF Analysis
WR-5B	WR		Dump on north side of creek; west edge 1/2 way down	None	5.0 (D)	0.04	N/A	N/A	XRF Analysis

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-005-WR-1 is composite of WR-1A through -1C and WR-2A through -2C. 20-005-WR-2 is composite of WR-3A and -3B. 20-005-WR-3 is composite of WR-4A through -4C.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:_____

Filled shafts: Yes___, No X, Number:___ Identification:_____

Seeps/Springs: Yes___, No X, Number:___ Identification:_____

Groundwater wells within 4 miles?: Yes X, No___;

Number of well logs: 65

Distance to nearest well used for drinking? < 0.5 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___, Possible X, Unlikely___.

Waste rock dumps contain elevated metal values and sulfides; large uncontained source in floodplain, groundwater probably shallow.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Frost Creek flows through site adjacent to road and waste dumps.

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): WR-1 through WR-5

Approximate Flood frequency? 1 yr, X 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 2.1 during investigation
High Flow: 9 cfs, Average Flow: 1.75 cfs

Distance between waste source(s) and nearest surface water body (ft)? 5 feet from WR-2 to Frost Creek.

Surface water draining onto or through waste sources: Yes , No X, Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, wetland, possibly agriculture

Observed erosional/sedimentation/stream turbidity problems? Yes , No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):

SAMPLERS: Tuesday, Belanger

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 5 acres

Wetlands present: Yes , No X, Describe:

Carbonate rocks/soils: Yes X, No , Describe: Host rock is described as limestone of the Hasmark Formation.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 ; 100-300 ; 300-1,000 ; 1,000-3,000 X; 3,000-10,000 ; 10,000 or greater ; Comments

Nearest residence(ft or miles)? 0.5 mile north

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (L.I.P.P.)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/FITTED/NO ESTIMATE (LOW/MOD/HIGH)
WR-1	FeOx; SO ₃ ; pH	Dry	13,500	13,500	Yes	Moderate
WR-2	FeOx; SO ₃ ; pH	Dry	32,400	32,400	Yes	Moderate
WR-3	FeOx; SO ₃ ; pH	Dry	22,500	22,500	Yes	Moderate
WR-4	FeOx; pH	Dry	31,500	31,500	Yes	Moderate
WR-5	FeOx; pH	Dry	6,300	6,300	Yes	Moderate

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe: _____

Population within 1 mile: 1-10____; 10-30____; 30-100 X; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments _____

Evidence of recreational use on site: Yes X, No____, Describe: Litter,
campfire ring _____

Accessibility - Fences, warning signs, closed roads? Berms on road
through mine; fence around shaft and signs; easy access. _____

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes____, No X, Comment _____
Wilderness Area - Yes____, No X, Comment _____
T&E Species Habitat - Yes X, No____, Comment Bald Eagle _____
Bat Habitat - Yes____, No X, Comment _____

Primary Drainage X; Secondary Drainage____; No Information____:

Riparian Habitat Quality - High____, Medium X, Low____
Wetlands Frontage - High____, Medium X, Low____
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 3

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 1, types and locations:____
Shaft is fenced and headframe has collapsed into it, but it is still
open and hazardous. _____

Hazardous structures: Yes X, No____, Number 2, types and locations:____
Old buildings on site. _____

Unstable highwalls, pits, trenches, slopes: Yes X, No____, Number 2,
types and locations: WR-1 has a dug out highwall; pit located north of
shaft. _____

Unstable waste piles, impoundments, undercut banks: Yes X, No____,
Number 1, types and locations: WR-1 has been dugout and has very
steep, unstable slopes in cirque-like structure. _____

Fire and/or Explosion hazards: Yes____, No X, Explain: _____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Algonquin site, Prepared by Northern Engineering and Testing, September 2, 1987.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Map, Philipsburg, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

ALGONQUIN
PA NO. 20-005

Algonquin PA# 20-005
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/23/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-005-SE-1	14	80.4	0.5 U	10.6	6.1	6.7 J	16500	0.025	591	2 J	98 J	4 U	238	NR
20-005-SE-2	13	119	1.2	8.3	3.2	9.8 J	10300	0.044	1700	6 J	185 J	4 U	600	NR
20-005-WR-1	99	65.6	10	3.4	6.2	69.1 J	21000	1.02	1540	13 J	747 J	17 J	4800	NR
20-005-WR-2	1420	36.7	34.8	7.3	21.9	1570 J	48000	1.02	4590	28 J	585 J	35 J	15300	NR
20-005-WR-3	776	51.3	35.4	16.9	8.4	690 J	28700	0.354	9850	51 J	1270 J	42 J	15400	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	TOTAL SULFUR %	NEUTRAL %	POTENTIAL %	TOTAL SULFUR %	ACID BASE %	POTENTIAL %	PYRITIC SULFUR %	ORGANIC SULFUR %	ACID BASE %	POTENTIAL %	PYRITIC SULFUR %	ORGANIC SULFUR %	ACID BASE %	POTENTIAL %
20-005-WR-1	1.28	40	145	105	0.4	0.24	0.64	7.5	137							
20-005-WR-2	2.17	67.8	117	48.7	1.05	0.41	0.71	12.8	104							
20-005-WR-3	1.53	47.8	408	360	<0.01	0.61	1.56	19.1	389							

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC
20-005-SW-1	3.19	23.1	2.57 U	9.7 U	6.83 U	1.55 U	104	0.038 U	37.7	12.7 U	0.38 U	30.7 U	56.4	21.3
20-005-SW-2	3.53	24.4	2.57 U	9.7 U	6.83 U	1.55 U	160	0.038 U	44.8	12.7 U	0.38 U	30.7 U	63.1	21.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-005-SW-1	94	< 5.0	8	0.06	NR
20-005-SW-2	75	< 5.0	8	0.05	NR

LEGEND

SE1 - Upstream of site in Frost Creek.
SE2 - Downstream from site, 100' in Frost Creek.
WR1 - Composite of subsamples WR1A through 1C and WR2A through 2C.
WR2 - Composite of subsamples WR3A and 3B.
WR3 - Composite of subsamples WR4A through 4C.
BACKGROUND - From the Granite Mountain Mine (20-110-S8-1).

SW1 - Same as sample SE1.
SW2 - Same as sample SE2.

XRF ANALYSIS RESULTS

**ALGONQUIN
PA NO. 20-005**

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-005-WR1-A		21840.7	26351.2			227.431 *	65068.6	358.097 *		792.961	167.328 *	71.9411
20-005-WR1-B		19465.2	41383			3471.23	16601.1		61.4756 *	6341.67	87.1718 *	114.747
20-005-WR1-C		12710.6	10873.8			2328.34	11624		55.4703 *	2721.15		60.4175
20-005-WR2-A		14319.5	58202.6			2530.41	14592.6		66.0025 *	4571.4		300.583
20-005-WR2-B		11948.6	42063.9			1425.86	19244.4	198.974 *	50.0558 *	1731.71	81.4621 *	68.6711
20-005-WR2-C		9892.54	28417.6			2070.08	33318.3	253.77 *		970.123	82.2993 *	57.0811
20-005-WR3-A		11807.8	34341.5			1474.49	67003.2	304.149 *	78.7393 *	1778.49	1582.89	492.158
20-005-WR3-B		15215	35560.2			4254.37	33205		226.974	4477.12	203.55	60.7406
20-005-WR4-A		10685.1	86868.3			12148	22983		39.8444 *	2720.57	172.552	79.8384
20-005-WR4-B		14774.4	41216.9			2207.31	18572.6	263.157 *	47.9459 *	1250.29	38.0041 *	237.384
20-005-WR4-C		13883.4	20475.3			15700.8	63728		968.808	7874.66	3257.45	186.176
20-005-WR5-A		21260.2	77681.1			740.798	16112			213.371	132.303	95.5782
20-005-WR5-B		33604.9	9298.13	3198.79		124407	46927.2			234.707	3077.54	79.1122
20-005-WR-1-COMP		17799.2	34374.3			1591.43	31416.4		103.956 *	2396.38	66.3848 *	105.091
20-005-WR-2-COMP		15664.4	31146.1			2727.57	51930		86.4606 *	2421.47	1017.92	364.733
20-005-WR-3-COMP		14209.2	70603			14767.3	40287.9		331.449	5876.87	950.901	167.625
Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th		
132.567			761.312	209.982			75.4163					
102.934			442.213	92.766			416.358					
139.536			403.08	41.6844			166.577					
192.219			1100.79	60.7556			147.137					
178.99			216.353	53.5077			156.614					
112.177			173.135	78.6959		106.948 *	93.5198					
86.0085			754.899	137.024			149.404	533.589 *				
119.029	43.7338 *		186.199	196.6			62.7734					
66.1365			156.98	44.2953			145.042					
84.5227			370.955	78.5054			329.637	264.559 *				
96.7138	69.5036 *		1971.98	130.135		61.4286 *	154.175	658.109 *				
49.6629			17.5488 *	59.3846			83.2938					
134.597			48.4108 *	218.916			59.7073	549.555 *				
159.984			585.908	88.9127		55.8567 *	178.166					
111.251	36.496 *		371.346	166.807			81.9813					
98.9725			829.645	99.23			225.439	361.342 *				

* - Estimated Quantity
\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

ALGONQUIN
PA NO. 20-005

AIMSS SCORESHEET

SITE NAME:

ALGONQUIN

PA NUMBER:

20-005

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	17.5
7	GW - TARGETS	WELLS - 1 TO 4 MI	58
8		NEAREST WELL	5
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9
			1163740
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD	EXCEEDENCES	0
13A	OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	39.087
17		IMPACTED DRAINAGE	0
18		WETLANDS	10
19	SW - TARGETS	FISHERY	1
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 - 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23
			359600
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD	CONTAINMENT	15
26B	OF RELEASE	DISTANCE TO POPULATION	10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	1000
30		NEAREST RESIDENCE	5
31	AIR - TARGETS	WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 - 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34
			83538
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF	ACCESSIBILITY	20
37B	EXPOSURE	DISTANCE TO POPULATION	10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT	POPULATION - 1 MILE	30
41	TARGETS	NEAREST RESIDENCE	5
42		RECREATIONAL USE	5
43		TARGETS SCORE	SUM LINES 40 - 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
			5080
45		TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	
		(LINES 10 + 24 + 35 + 44) / 100,000	16.12

LINE NO.				SITE NAME:	ALGONQUIN
				PA NUMBER:	20-005
		SITE SAFETY			
1	THREAT	ACCESSIBILITY			20
2		OPEN SHAFTS	100 EA.		100
3		OPEN ADITS	50 EA.		0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		150
5		HAZ. STRUCTURES	40 EA.		80
6		EXPLOSIVES			0
7		HAZ. MATERIALS			100
8		HAZARDS SCORE	SUM LINES 2 - 7		430
9		POPULATION - 1 MILE			30
10	TARGETS	NEAREST RESIDENCE			5
11		RECREATIONAL USE			5
12		TARGETS SCORE	SUM LINES 9 - 11		40
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000		344.00



20-005, #1: SW-2 and SE-2 sample location



20-005, #2: View of mine site



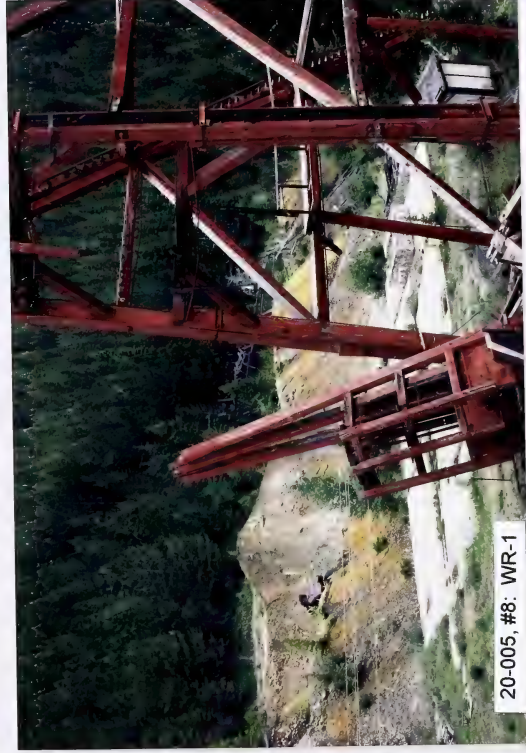
20-005, #3: WR-5 (adit)



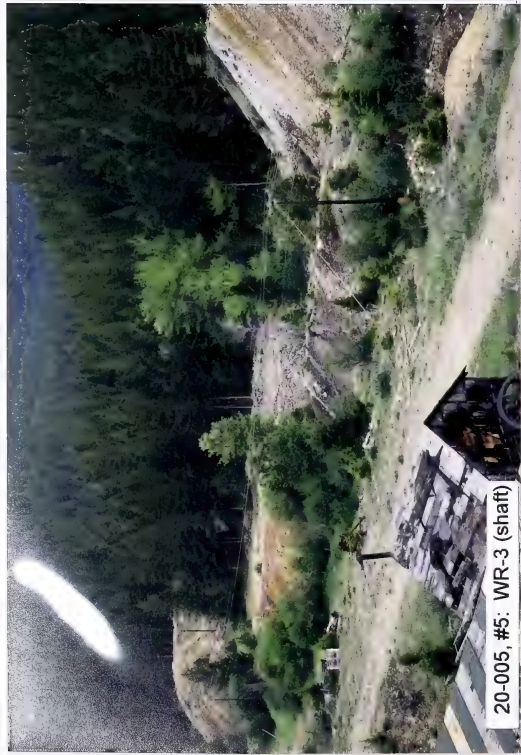
20-005, #4: WR-4



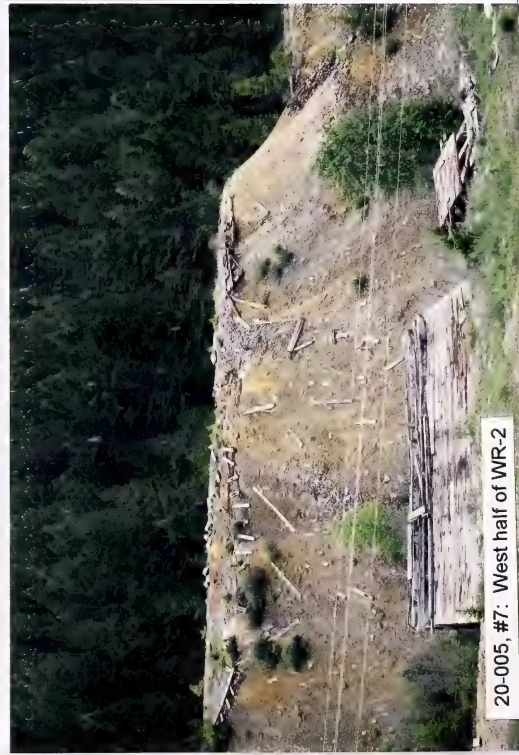
20-005, #6: East half of WR-2



20-005, #8: WR-1



20-005, #5: WR-3 (shaft)



20-005, #7: West half of WR-2

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: RUMSEY PA#: 20-018

Date: June 24, 1993 Time: 0900-1550

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Mostly cloudy; cool; breezy;
cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #14: SE-1 upgradient
sediment; #15: Adit (HMO) and SW-2 location; #16: WR-2 in
foreground, WR-3 in background; #17: WR-1, west end; #18: East end
of mill; #19: WR-1 eastern end; #20-#22: Mill remains; #23: TP-1,
meadow revegetated tailings; #24: SE-3 location downstream
sediment. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site was by truck. Background sample used for this site
is from the Granite Mountain (20-110) site.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Block adit;
assist natural revegetation of waste rock and streamside tailings.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): RUMSEY PA#: 20-018

Legal Description: T 6N ; R 13W ; Sec. 8 , NE1/4 NE1/4 1/4

County: GRANITE Mining District: PHILIPSBURG

Latitude: N 46° 17' 32" Longitude: W 113° 14' 49"

Primary Drainage Basin and Code: Flint Creek/17010202

Secondary Drainage Basin: Fred Burr Creek

USGS Quadrangle map name(s): Philipsburg/Fred Burr Lake

Mine Type/Commodities: Hardrock/Gold, Silver

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): Gerald G. Wing,
P.O. Box 110, Glenbrook, NV 89413. (707) 963-5231; Deerlodge
National Forest.

Relationship to other mines/sites in the area/district: Approx.
1.5 miles from Granite Mountain and Bi-Metallic mines; tunnel
driven from Rumsey to Granite Mountain mine.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? The Philipsburg district is currently
listed under the CECRA Program.

General site features: Elevation 5800' , Slope 5°-10° ,
Aspect Southeast

Land use: Mining , Recreational X , Residential , Urban ,
Agricultural , Other(Specify)

Area of disturbed/unvegetated lands? 4.6 acres.
Dimensions: 1,000 feet x 200 feet

Predominant vegetation types: Lodgepole pine, fir

Access: roads - good , poor , 4wd X , trail .
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Deposit type was vein filling fissures.
Site lies on the north side of perennial Fred Burr Creek, which
flows southwest past the site.

Mining/milling history, ore type/tenor, host rock, gangue: Site
was discovered in 1860s with large production in the early 1890s
and closure in 1893. Dumps were worked in 1906 and tailings were
reworked at Granite Mountain or Bi-Metallic sites in the same year.
This site has the same deposit type as Granite Mountain and Bi-
Metallic. No other information available.

Mine Operation?

Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 1, Comment 10'x12'; open; flowing
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three
questions:

Period(s) of Operation: 1890s to Unknown

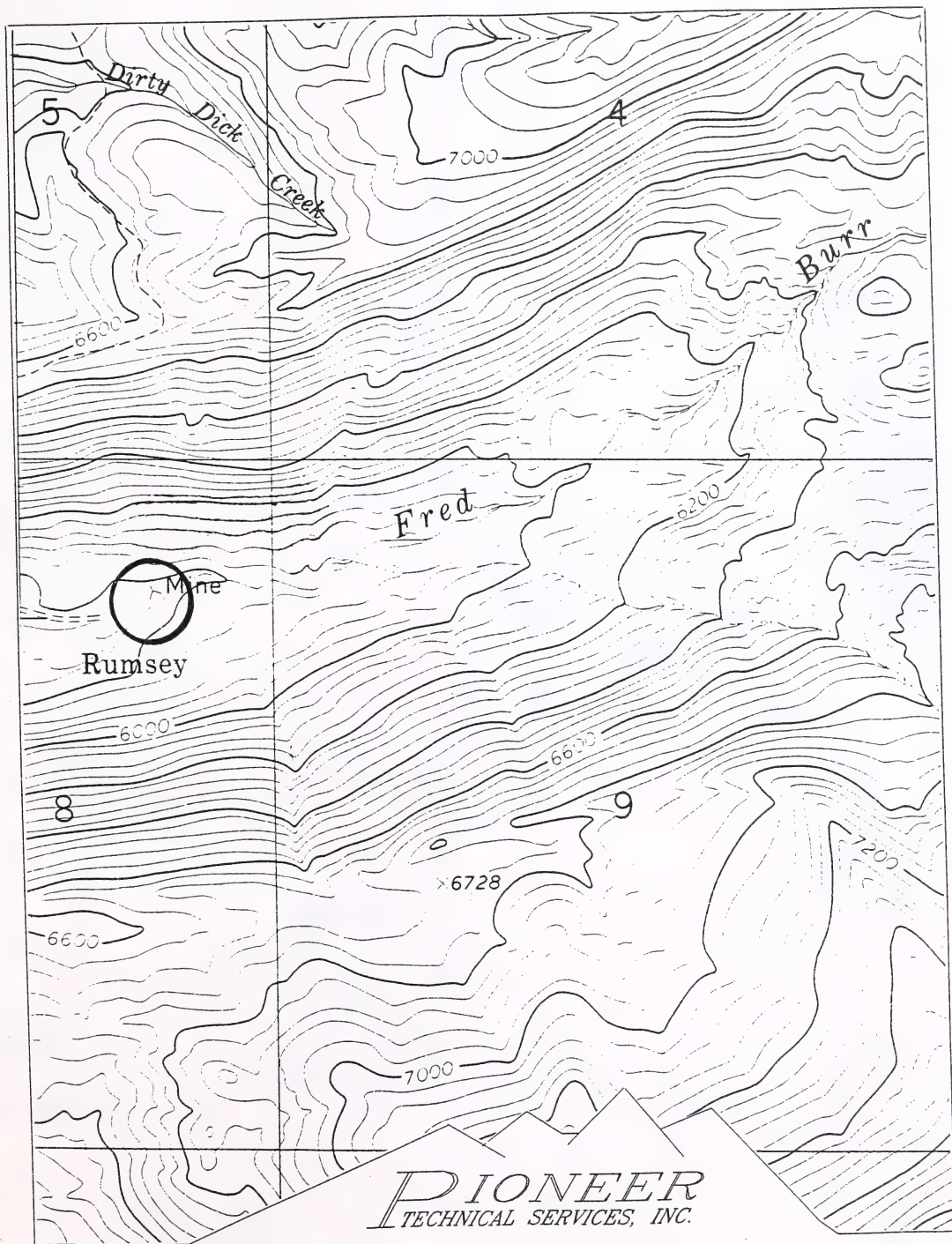
Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: Granite Mountain and
Bi-Metallic sites were connected to this site by a wire tramway in
the early 1890s.

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
Floatation; 100-stamp with chloridizing roasting and pan
amalgamation.

Montana Bureau of Mines and Geology
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
M:53599	06N 13W 07 AD	30.0	5.0	8.00
M:53600	06N 13W 07 CAAA	42.0	40.0	6.00



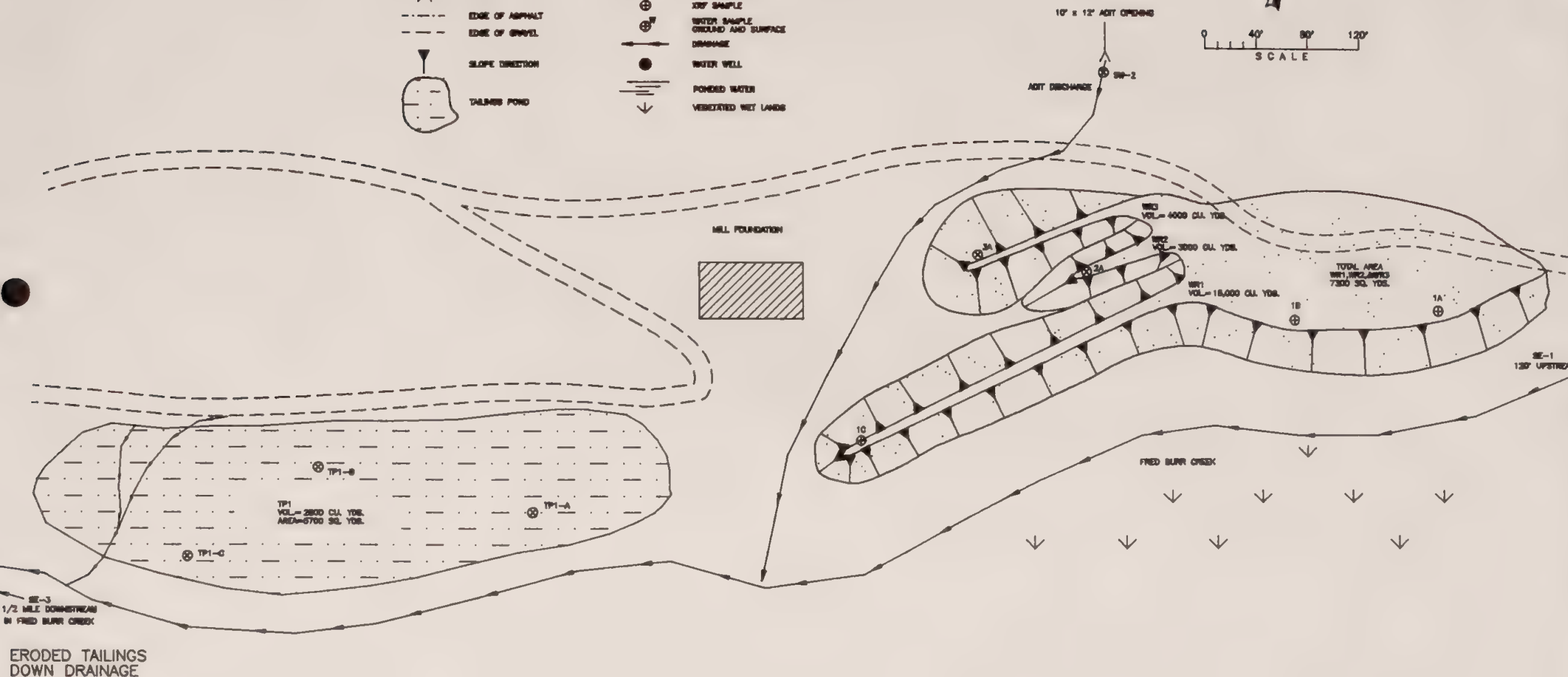
RUMSEY, P.A. NO. 20-018

T06N, R13W, SECTION 08

SCALE: 1" = 1000'

LEGEND

	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WHITE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBER
	BUILDING		RAIL
	BANNER POST		XRF SAMPLE
	GATE		WATER SAMPLE
	EDGE OF ASPHALT		GROUND AND SURFACE DRAINAGE
	EDGE OF GRAVEL		WATER WELL
	SLOPE DIRECTION		PONDED WATER
	TAILINGS POND		VEGETATED WET LANDS



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

RUMSEY PA# 20-018
PHILIPSBURG DISTRICT GRANITE COUNTY

PIONEER

TDSH

DRAWN: JIP DATE: 7 OCT 83
DESIGNED: JIP JOB NO. 83-17
APPROVED: MJB F.B. NO.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPokane MONTANA WASHINGTON

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Mixed sand and silt sizes in floodplain; some iron cementation.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): No impoundments; maximum depth is 2.5 feet; average depth appears to be 1.5 feet.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments):
Partially wet

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundments

Comments on potential for mitigation: Tailings down Fred Burr Creek in flood plain sediments; mostly self-revegetated.

SAMPLERS: Tuesday, Belanger

[illegible]

P. Divalent vanadium (Kalyan Mater); S. Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 20-018-WR-1 is composite of WR-1A through -1C, -2A, and -3A. 20-018-Tp-1 is composite of TP-1A-1, TP-1B-1, and TP-1C-1.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No , Number: 1 Identification: SW-2

Filled shafts: Yes , No X, Number: Identification:

Seeps/Springs: Yes X, No , Number: 1 Identification: North of TP-1

Groundwater wells within 4 miles?: Yes X, No ;

Number of well logs: 72

Distance to nearest well used for drinking? Approx. 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable , Possible , Unlikely X.

Metal values in dumps and tailings are slightly elevated; shallow groundwater.

Other observations/notes: N/A

SAMPLERS: Tuesday, Belanger

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Fred Burr Creek

Dry streambeds: Yes , No X, Name(s):

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): TP-1 and WR-1

Approximate Flood frequency? X ^{TP-1} 1 yr, X ^{WR-1} 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 50 cfs
High Flow: 400 cfs, Average Flow: 50 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet to TP-1; 15 feet to WR-1.

Surface water draining onto or through waste sources: Yes , No X, Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Residences downstream of site; therefore, could be used for irrigation, and possible agriculture.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No , Distance downstream (ft)? 5000 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Tailings observed in stream for at least 1 mile downstream.

SAMPLERS: Tuesday, Belanger

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5+ acres

Wetlands present: Yes X, No , Describe: Site lies in creek flood-plain where there is abundant natural wetlands already present.

Carbonate rocks/soils: Yes , No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 ; 100-300 ; 300-1,000 ; 1,000-3,000 X; 3,000-10,000 ; 10,000 or greater ; Comments

Nearest residence(ft or miles)? 1 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

SAMPLERS: Tuesday, Belanger

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe:_____

Population within 1 mile: 1-10 X; 10-30____; 30-100____; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments_____

Evidence of recreational use on site: Yes X, No____, Describe:_____
Campfire rings_____

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Bald Eagle</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium <u>X</u> , Low____
Fisheries Habitat and Species Classification -	<u>Not Rated</u>
Sport Fishery Classification -	<u>Not Rated</u>

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 1, types and locations:____
Adit 10'x12'

Hazardous structures: Yes X, No____, Number 1, types and locations:____
Mill foundation

Unstable highwalls, pits, trenches, slopes: Yes____, No X, Number____,
types and locations:_____

Unstable waste piles, impoundments, undercut banks: Yes____, No X,
Number____, types and locations:_____

Fire and/or Explosion hazards: Yes____, No X, Explain:_____

Bibliography

MBMG, Rumsey Tailings, Granite County, Form 39, 1967-1969.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Rumsey site, Prepared by Northern Engineering and Testing, September 3, 1987.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle, Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Maps, Philipsburg/Fred Burr Lake Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

RUMSEY
PA NO. 20-018

Rumsey PA# 20-018
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/24/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-018-SE-1	4	25.3 J	0.5 U	3	2	2.6	8100	0.068 J	93.6 J	3 J	5 U	4 U	11	NR
20-018-SE-3	196	64 J	0.8	4.1	1.2	20.3	12100	5.56 J	788 J	4 J	67	5	277	NR
20-018-TP-1	520	233 J	9.3	10.6	8.4	63.8	31200	4.7 J	1550 J	13 J	195	6	1130	0.304
20-018-WR-1	5	201 J	0.5 U	15.7	6.8	15.8	26300	0.423 J	542 J	8 J	4 U	4 U	52	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE SULFUR u/1000r	NEUTRAL POTENT. u/1000r	SULFUR ACID BASE POTENT. u/1000r	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENT. u/1000r	SULFUR ACID BASE POTENT. u/1000r
20-018-TP-1	0.01	0.31	4.27	3.95	0.01	<0.01	0	4.27
20-018-WR-1	<0.01	0	46.5	46.5	0.02	<0.01	0	46.5

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-018-SW-2	0.98 U	3.63	2.57 U	9.7 U	6.83 U	1.55 U	73.9	0.11	8	12.7 U	0.38 U	30.7 U	7.57 U	80.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-018-SW-2	122	< 5.0	12	0.09	NR

LEGEND

SW2 - Acid discharge

SE1 - Upstream in Fred Burr Creek - 120 feet.

SE3 - Downstream in Fred Burr Creek - 1/2 mile

TP1 - Composite of subsamples TP1B-1, 1A-1, and 1C-1.

WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, and 3A.

BACKGROUND - From the Granite Mountain Mine (20-110-S8-1).

XRF ANALYSIS RESULTS

RUMSEY
PA NO. 20-018

Mine Name: Rumsey PA# 20-018
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-018-TP1A-1		15359.5	13544.4	1748.28		2277.44	38820.4		56.0885 *	586.706	259.31	394.572
20-018-TP1A-2		21623.9	11713.1			1667.29	21072.8			168.338	44.6518 *	403.153
20-018-TP1B-1		14398.7	12658.3	2800.38		1979.42	42762.5		56.7967 *	776.51	164.176	344.922
20-018-TP1C-1		16511.7	12622.3	938.163		3002.36	2977.1			877.417	194.405	323.167
20-018-TP-1-COMP		17245.3	12819.3	1777.32		2792.51	36928		80.3666 *	981.373	492.865	359.206
20-018-WR1-A		7576.15	21347.3	9884.23	3571.26	1098.42	27294.4			103.871		418.843
20-018-WR1-B			13826.7	9548.75	3433.74	707.722 *	31599.7			139.653		257.533
20-018-WR1-C		4451.53	24804.1	9284.86	3396.05	678.75 *	28874.2	229.32 *		125.766		420.152
20-018-WR2-A		2086.71 *	15954.7	10265.9	3402.72	501.29 *	30790.3			143.596		327.152
20-018-WR3-A		4940.3	17920.9	8831.36	3273.71	523.357 *	26413.5			143.822		391.936
20-018-WR-1-COMP		4274.95	18980.5	9548.68	3486.33	652.44 *	30764.1			137.8		348.401
20-018-TP1A-1	Zr	251.983		Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-018-TP1A-2		72.3892		24.8776 *	88.6004			701.374		18.2155 *	6.40279	
20-018-TP1B-1		252.557	9.58252 *	42.4816 *	85.5899			646.744				
20-018-TP1C-1		187.143		17.53 *	78.4133			663.083	328.068 *	24.9776 *	6.36503	
20-018-TP-1-COMP		208.163		122.13	87.8111			540.674		14.8615 *		
20-018-WR1-A		107.768	6.00648 *		99.6848			642.239				
20-018-WR1-B		121.126	4.48741 *		76.9093			679.531				
20-018-WR1-C		115.616	5.84834 *		53.5285			471.009				
20-018-WR2-A		117.252	5.63125 *		58.5223			684.466				
20-018-WR3-A		109.18	5.11187 *		54.197			545.671				
20-018-WR-1-COMP		120.604	4.61189 *		56.5024			569.906				
					62.0923			540.517				

* - Estimated Quantity
\$ - Unvalidated Data

**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**RUMSEY
PA NO. 20-018**

AIMSS SCORESHEET

SITE NAME:

RUMSEY

PA NUMBER:

20-018

LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.228
6		WELLS - 1 MI. x 2.5		5.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		70
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	75.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	36840

		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A	SW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.399
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		5
18		WETLANDS		10
19	SW - TARGETS	FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	27
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	26441

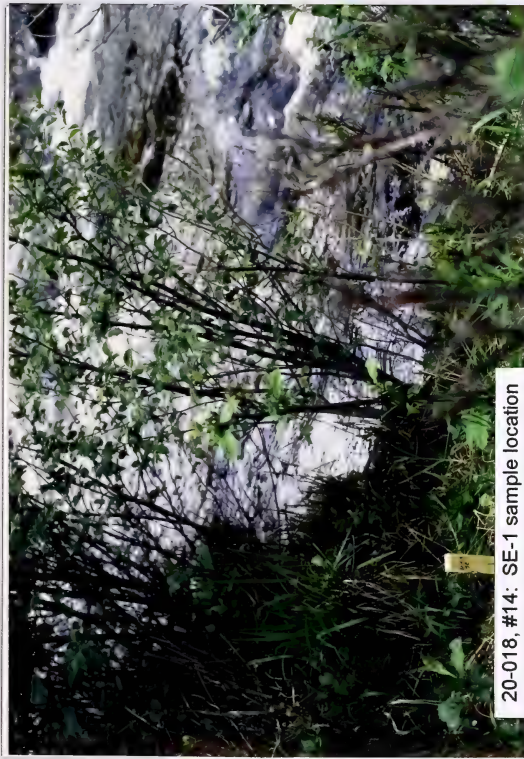
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.009
29		POPULATION - 4 MILES		1000
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	1015
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	457

		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.007
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 - 42	6
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	6

45 TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE
(LINES 10 + 24 + 35 + 44) / 100,000

0.64

LINE NO.				SITE NAME:	RUMSEY
				PA NUMBER:	20-018
1	SITE SAFETY				
2	THREAT	ACCESSIBILITY			20
3		OPEN SHAFTS	100 EA.		0
4	HAZARDS	OPEN ADITS	50 EA.		50
5		UNSTAB. HIWALLS / PITS	75 EA.		0
6		HAZ. STRUCTURES	40 EA.		40
7		EXPLOSIVES			0
8		HAZ. MATERIALS			0
9		HAZARDS SCORE	SUM LINES 2 - 7		90
10	TARGETS	POPULATION - 1 MILE			1
11		NEAREST RESIDENCE			0
12		RECREATIONAL USE			5
13		TARGETS SCORE	SUM LINES 9 - 11		6
		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000		10.80



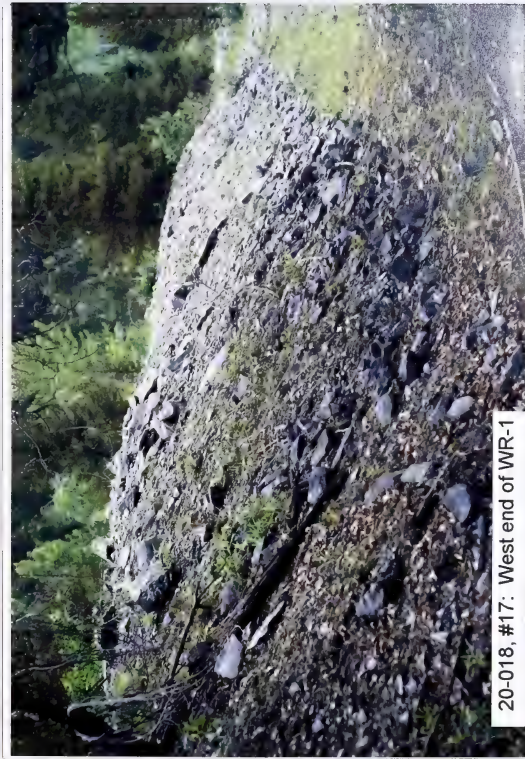
20-018, #14: SE-1 sample location



20-018, #15: Adit (HMO) and SW-2 sample location



20-018, #16: WR-2 (foreground) and WR-3 (background)



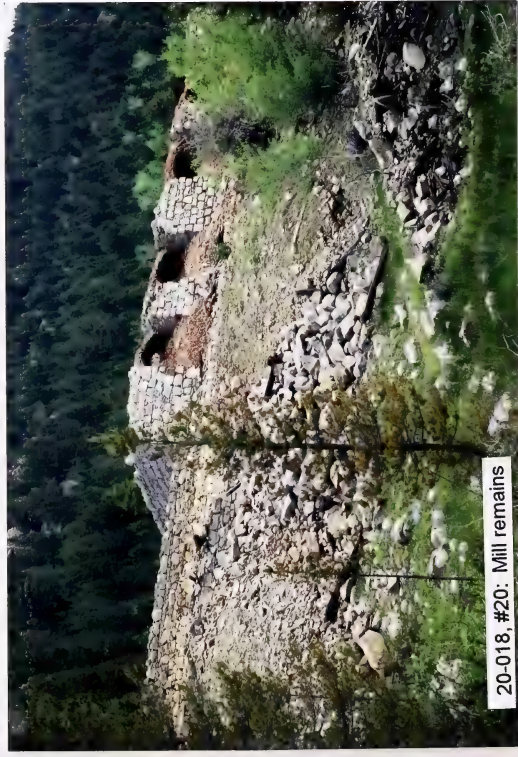
20-018, #17: West end of WR-1



20-018, #18: East end of mill



20-018, #19: East end of WR-1



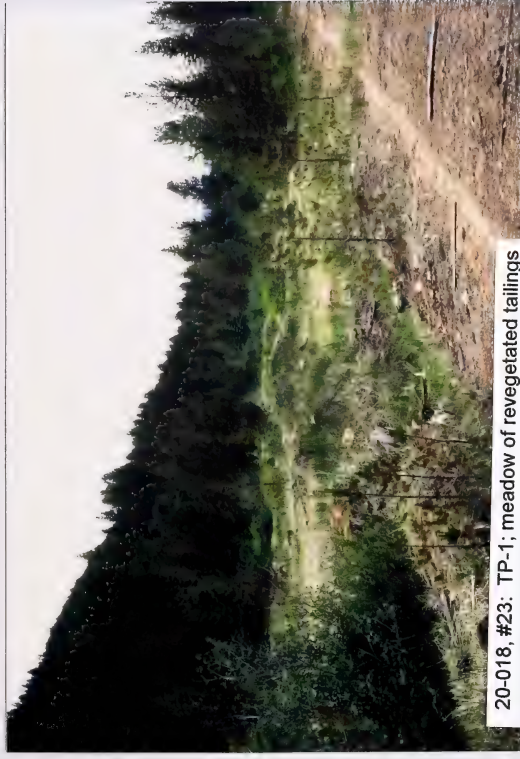
20-018, #20: Mill remains



20-018, #21: Mill remains



20-018, #22: Mill remains



20-018, #23: TP-1; meadow of revegetated tailings



20-018, #24: SE-3 sample location

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: SCRATCH ALL PA#: 20-019

Date: June 22, 1993 Time: 1730

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flamman, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Cool; intermittent snow; cool,
wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #14: Headframe,
Shaft #1, and Tram; #15: Tram north end and WR-1; #16: Slag and
furnace building; #17: WR-1; #18: Explosives bunker or root cellar;
#19: WR-2. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: In winch house,
there is a 55 gal. drum 1/4 full of possibly lube oil (has Texaco
markings). Behind the winch house, there is an old transformer
which is open and empty, with no apparent oil staining on the
ground. There are two fuel tanks, 20 and 1,000 gal., with one
appearing to be empty, but may contain sludge. Cannot determine
the status of the second tank. The building with the furnace has
some 5"x5" blocks that may be compressed asbestos.

General Comments on Potential Remedial Alternatives: Regrade,
amend, and revegetate. Remove hazardous structures and close
hazardous mine openings.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): SCRATCH ALL PA#: 20-019

Legal Description: T 7N ; R 13W ; Sec. 30 , NE 1/4 SE 1/4 1/4

County: GRANITE Mining District: PHILIPSBURG

Latitude: N 46° 19' 53" Longitude: W 113° 15' 59"

Primary Drainage Basin and Code: Camp Creek/17010202

Secondary Drainage Basin: Camp Creek

USGS Quadrangle map name(s): Philipsburg

Mine Type/Commodities: Hardrock/Manganese, Lead, Zinc, Silver

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Granite Resource, 1029 Choteau, Helena, MT 59601. (406) 443-2510; Peter Antonioli, 1405 Steele, Butte, MT 59701. (406) 723-8730.

Relationship to other mines/sites in the area/district: Very near Trout, True Fissure, and Algonquin mines.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Stopes and two shafts have been fenced off with barb wire by MDSL. The Philipsburg district is currently listed under the CECRA Program.

General site features: Elevation 6100' , Slope 15° , Aspect Northern

Land use: Mining , Recreational X , Residential , Urban , Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? Approx. 4 acres.
Dimensions: 560 feet x 500 feet

Predominant vegetation types: Douglas fir, aspen, juniper, buffalo berry

Access: roads - good X , poor , 4wd , trail .
Other logistical considerations (proximity to other sites). Must walk .25 mile to site; berms on both roads leading to the site.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 7 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies near the top of dry drainage facing north, which would connect with an intermittent drainage approx. 300 feet below the site. Water from the unnamed intermittent drainage flows into the perennial Camp Creek 1/4 mile after the confluence.

Mining/milling history, ore type/tenor, host rock, gangue: The Scratch All vein is north and parallel to the Salmon vein, which is approx. 300 feet north of the Trout shaft. This vein was originally exploited through the Sharktown Tunnel. The vein was inaccessible in 1907, but redeveloped sometime later. The mine was last operated in the 1970s.

Mine Operation?

Shafts - Yes X, No , # 2, Comment Both partially fenced
Adits - Yes X, No , # 2, Comment 1 open; 1 blocked
Pits - Yes X, No , # 1, Comment
Placers - Yes , No X, # , Comment
Other - Yes X, No , # 2, Comment Stopes; fenced

Mill Operation? Yes , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

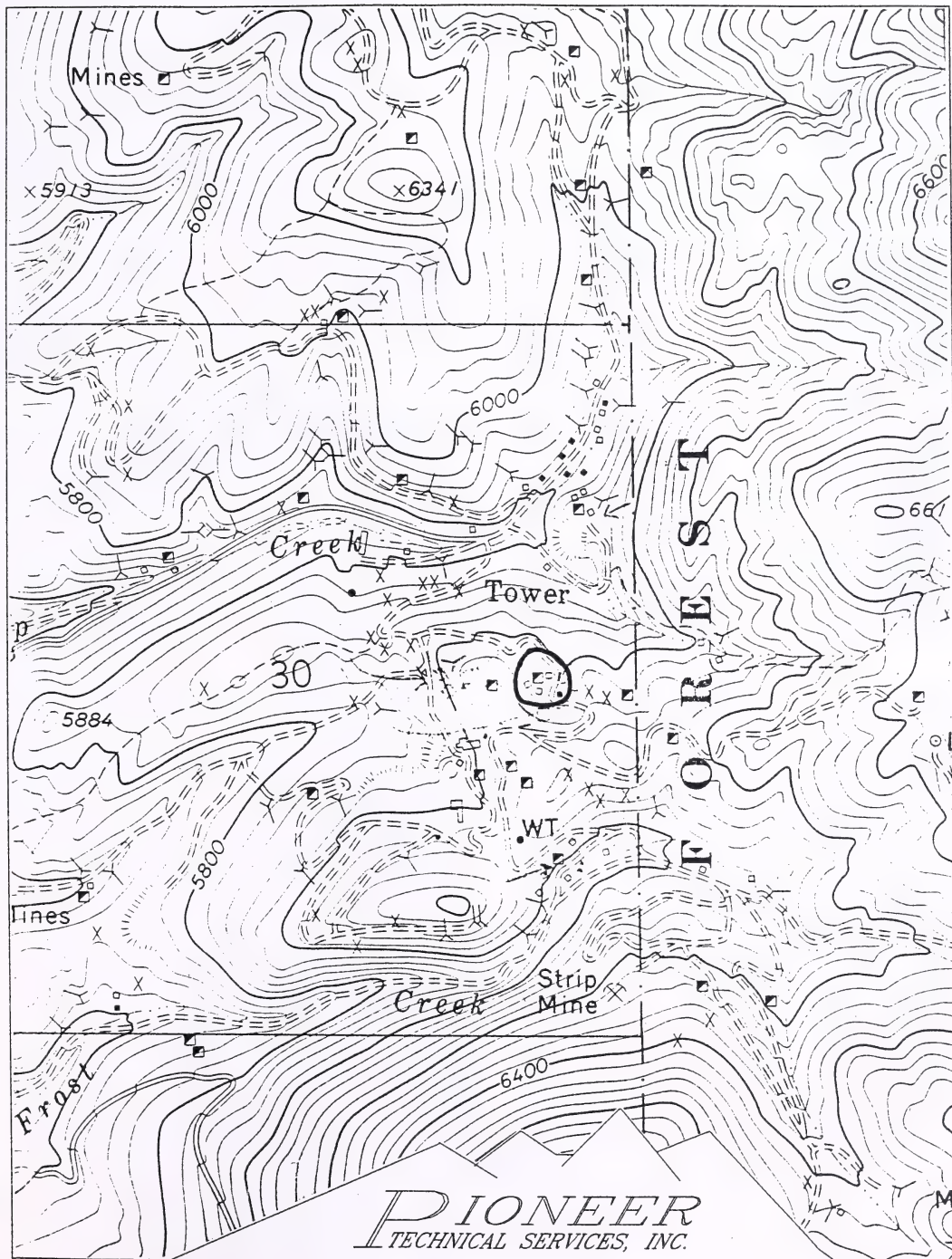
Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
M:55960	07N 14W 25	192.0	0.0	0.00
M:55961	07N 14W 25	35.0	20.0	0.00
M:55980	07N 14W 36 BA	90.0	0.0	38.00
M:55981	07N 14W 36 BADD	125.0	0.0	0.00
M:55982	07N 14W 36 CA	40.0	7.0	20.00
M:55983	07N 14W 36 CACC	68.0	20.0	48.00
M:55984	07N 14W 36 CC	48.0	4.0	11.00



SCRATCH ALL, P.A. NO. 20-019

T07N, R13W, SECTION 30

SCALE: 1" = 1000'

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Flammanq

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (MR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	540,000	West side of Tram near top	None	6.6 (D)	0.07	20-019-WR-1	06/22/93 2230	T-Metals, ABA
WR-1B	WR		East side of Tram	None	6.5 (D)	0.03	20-019-WR-2	06/22/93 2230	T-Metals, ABA
WR-1C	WR		Near middle of WR-1 near top	None	6.1 (D)	0.05			
WR-1D	WR		Just below small loadout on east end of dump before culvert	None	5.8 (D)	0.05			
WR-1E	WR		North of machine shop on WR-1	None	6.25 (D)	0.03			
WR-1F	WR		Small pile adjacent to main WR-1, north of house near top	None	6.75 (D)	0.03			
WR-2	WR	2,000	East of WR-1 by fenced stopes on larger of two dumps	None	6.05 (D)	0.03			
WR-3	WR	750	Associated with Adit #1 SSW of winch building	None	6.8 (D)	0.05			
Tanks	OTH		East side of winch building; empty	Tank	N/A	N/A	N/A		
SL-1	OTH	10	West end of site	None	6.8 (D)	0.04			
Transformers	OTH		South of winch building, no stained soil; empty	None	N/A	N/A			
ACH	OTH		Two small blocks near winch building	None	N/A	N/A			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-019-WR-1 is composite of WR-1A, -1E, and WR-2.
 20-019-WR-2 is composite of WR-1B, -1C, and -1D.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:_____

Filled shafts: Yes___, No X, Number:___ Identification:_____

Seeps/Springs: Yes___, No X, Number:___ Identification:_____

Groundwater wells within 4 miles?: Yes X, No___;
Number of well logs: 65

Distance to nearest well used for drinking? Approx. 0.5 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___, Possible X, Unlikely___.

Shaft equipped with pumps, working in groundwater. Dumps show elevated levels of metals, so rocks in contact with groundwater likely contain metals.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X, Name(s):_____

Dry streambeds: Yes____, No X, Name(s):_____

Other surface water: Yes____, No X, Name(s)/Description:_____

Waste materials within any floodplain: Yes____, No X Source ID(s):_____

Approximate Flood frequency?__1 yr, __10 yr, __100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow:_____, Average Flow:_____

Distance between waste source(s) and nearest surface water body (ft)?_
Intermittent drainage approx. 300 feet from the toe of WR-1.

Surface water draining onto or through waste sources: Yes____, No X,
Describe:_____

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)

Stock watering

Observed erosional/sedimentation/stream turbidity problems? Yes X,
No____, Distance downstream (ft)? N/A Describe/explain (Note streambank
stability and condition of streambank vegetation and any manmade structures or channel changes present):
Some erosion of dumps, but no distinct drainage/runoff path to the
intermittent drainage approx. 0.2 mile northeast of the toe of WR-1.

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO₃)
Presence of evaporative salt deposits? (ESD)
Discolored or turbid seepage? (SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?
Presence of ferric hydroxide precipitates? (FEOX)
Presence of burned or stressed vegetation? (VEG)
pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? N/A

Wetlands present: Yes , No X, Describe:

Carbonate rocks/soils: Yes X, No , Describe: Limestone rocks
present as float in dumps.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 ;
100-300 ; 300-1,000 X; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 0.3 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Flammang

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	Very little pyrite; neutral pH; None	Dry/Moist	63,000	56,700	Yes	Low
WR-2	None	Dry	7,650	6,900	Yes	Low
WR-3	None	Dry	5,850	2,925	Yes	Low
SL-1	None	Dry	50	50	No	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe: _____

Population within 1 mile: 1-10 X; 10-30____; 30-100____; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments _____

Evidence of recreational use on site: Yes X, No____, Describe: Off-
road vehicle tracks; campfire rings

Accessibility - Fences, warning signs, closed roads? Berm on road
1/4 mile below site; fences and warning signs around two shafts and area
of stopes.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes____, No X, Comment _____
Wilderness Area - Yes____, No X, Comment _____
T&E Species Habitat - Yes____, No X, Comment _____
Bat Habitat - Yes X, No____, Comment Two open adits

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality - High____, Medium X, Low____
Wetlands Frontage - High____, Medium X, Low____
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 4, types and locations:____
Two shafts, fenced; one adit, partially blocked; one adit (#2), wide
open.

Hazardous structures: Yes X, No____, Number 6, types and locations:____
Winch house, tram and shops, house, loadouts

Unstable highwalls, pits, trenches, slopes: Yes X, No____, Number 1,
types and locations: Highwall at pit

Unstable waste piles, impoundments, undercut banks: Yes X, No____,
Number 1, types and locations: WR-1 is very steep, unvegetated, and
at angle of repose.

Fire and/or Explosion hazards: Yes____, No X, Explain: _____

Bibliography

MBMG, Scratch All, Granite County, Form 39, 1966-1974.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Scratch All, Prepared by Northern Engineering and Testing, September 2, 1987.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle, Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Map, Philipsburg, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

SCRATCH ALL
PA NO. 20-019

Scratch All PA# 20-019
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/22/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-019-WR-1	377	80.4	33.3	4	9.3	386 J	14200	1.14	11700	62 J	2950 J	28 J	17700	NR
20-019-WR-2	264	75.5	9.5	6.5	11.1	166 J	18000	0.654	18700	95 J	1090 J	7 J	4480	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	NEUTRAL, ACID BASE POTENT. U/1000	SULFUR ACID BASE POTENT. U/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. U/1000	SULFUR ACID BASE POTENT. U/1000
20-019-WR-1DUF	1.76	55	495	2.45	2.25	70.3	479
20-019-WR-1	1.77	55.3	492	2.44	2.24	70	478
20-019-WR-2	0.15	4.69	558	0.81	0.9	28.1	534

LEGEND

WR1 - Composite of subamples WR1A, 1E, and 2.
WR2 - Composite of subamples WR1B, 1C, and 1D.
BACKGROUND - From the Granite Mountain Mine (20-110-SS-1).
WR1DUP - Duplicate of the 20-019-WR - 1 sample.

XRF ANALYSIS RESULTS

**SCRATCH ALL
PA NO. 20-019**

XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-019-SL-1	41.6535	7034.19	48636.8	371.996		87676.2	9910.8		148.742 *	3932.18	142.513 *	259.849
20-019-WR1-A	87.5256	8282.6	65132.9	842.582		14420.1	23203.8		389.556	9412.17	242.194 *	141.001
20-019-WR1-B	47.373	1148.39 *	141237	377.826		11042.9	9544.57		134.191 *	4116.94		40.4681
20-019-WR1-C	139.562		53657.4	2164.01		20430.2	17363.4		166.751 *	4007.24	241.404	94.9086
20-019-WR1-D	114.108	7487.31	65797.1	2426.52		4287.9	24372.2		57.2849 *	2417.44	72.47 *	62.4962
20-019-WR1-E	136.318	13143	47822.9	1467.29		18223.3	14558.9		158.401 *	9025.71	101.443 *	93.0557
20-019-WR1-F	167.859	4439.13	79980.5	316.068		59451.4	26302		303.458	4375.08	521.046	126.908
20-019-WR-1-COMP		11650.6	70665.4	1407.19		13407.9	16318.6		202.838 *	8797.83	175.945 *	119.257
20-019-WR-2	94.2032	4245.27	91244.8	839.984		6569.53	13731.2		190.737 *	10134.8		90.6686
20-019-WR-2-COMP	96.2701	4295.35	92413	1557.66		7503.66	19141.7		121.478 *	3434.68	72.4198 *	60.3491
20-019-WR-3	157.99	17770	124719	1236.11		710.423 *	11174.2		45.7654 *	747.569	271.465	204.797
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-019-SL-1	41.6535		7.62403 *	696.454	55.6307			279.628	247.425 *		11.6031	
20-019-WR1-A	87.5256			1301.06	50.1585			283.254				
20-019-WR1-B	47.373		4.55876 *	764.788	23.0858 *			201.97	337.958 *			
20-019-WR1-C	139.562		4.45841 *	572.509	53.9089		35.6642 *	196.845	411.318 *		16.8408	
20-019-WR1-D	114.108		7.6406 *	499.416	20.7187 *			72.7321	396.819 *			
20-019-WR1-E	136.318	58.2363 *	4.64224 *	1045.27	39.1494 *			158.37	327.165 *		13.7721	
20-019-WR1-F	167.859	66.7068 *	5.63511 *	1485.04			53.5362 *	106.197	485.121 *			
20-019-WR-1-COMP		42.308 *	4.5199 *	1300.66	50.07		54.467 *	200.011	641.791 *		9.67296	
20-019-WR-2	94.2032			1059.49	26.5606 *			127.742	277.852 *			
20-019-WR-2-COMP	96.2701			579.843				134.497	290.246 *			
20-019-WR-3	157.99		6.85544 *	47.2535 *	30.5687 *			101.989		14.3139 *	15.2833	

* - Estimated Quantity

\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

SCRATCH ALL
PA NO. 20-019

AIMSS SCORESHEET

SITE NAME:

SCRATCH ALL

PA NUMBER:

20-019

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	400
4		LIKELIHOOD SCORE	400
5	GW - WASTE CHAR.	CALCULATED SCORE	770.643
6		WELLS - 1 MI. x 2.5	17.5
7	GW - TARGETS	WELLS - 1 TO 4 MI	58
8		NEAREST WELL	5
9		TARGETS SCORE	80.5
10		GROUNDWATER SCORE	24814705
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	2
13C		POTENTIAL TO RELEASE	40
14		LIKELIHOOD SCORE	40
15	SW - WASTE CHAR.	CALCULATED SCORE	838.694
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18	SW - TARGETS	WETLANDS	0
19		FISHERY	0
20		RECREATION	0
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	7
24		SURFACE WATER SCORE	234834
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	50
27		LIKELIHOOD SCORE	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	0.529
29		POPULATION - 4 MILES	300
30		NEAREST RESIDENCE	0
31	AIR - TARGETS	WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	315
35		AIR PATHWAY SCORE	8332
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	10
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	50
38		LIKELIHOOD SCORE	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	0.485
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	1
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	5
43		TARGETS SCORE	6
44		DIRECT CONTACT SCORE	291
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		250.58
	(LINES 10 + 24 + 35 + 44) / 100,000		

LINE NO.	SITE NAME: PA NUMBER:		SCRATCH ALL
			20-019
	SITE SAFETY		
1	THREAT	ACCESSIBILITY	10
2	HAZARDS	OPEN SHAFTS	100 EA.
3		OPEN ADITS	50 EA.
4		UNSTAB. HIWALLS / PITS	75 EA.
5		HAZ. STRUCTURES	40 EA.
6		EXPLOSIVES	0
7		HAZ. MATERIALS	100
8		HAZARDS SCORE	SUM LINES 2 - 7
9	TARGETS	POPULATION - 1 MILE	1
10		NEAREST RESIDENCE	0
11		RECREATIONAL USE	5
12		TARGETS SCORE	SUM LINES 9 - 11
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000
			42.90



20-019, #14: Headframe, Shaft #1 and tram



20-019, #15: Tram (north end) and WR-1



20-019, #16: Slag and furnace building



20-019, #17: WR-1



20-019, #19: WR-2

SCRATCH ALL
20-019
#15



20-019, #18: Explosive's bunker or root cellar (hazardous)

Scratch All
20-019
#14

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: TROUT PA#: 20-062

Date: June 21, 1993 Time: 0910

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Overcast; calm; 60°F; started raining at 1300-wind, hail, rain on and off the rest of the day.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #26-#27: TP-3; #28: WR-3 and Shaft #3; #29: TP-2; #30: Dry drainage through TP-1; #31: TP-1; #32: Newer mill; #33: Old mill foundation; #34: Breached dam; #35: Adit #7 unfenced. Roll #2: #1: Facing west at SL-3 (foreground) and WR-6 (background), pit wall off to north; #2: Highwall in pit; #4: WR-5A (sample hole to far left) and -5B, Shaft #5 (fenced in middle of photo); #5: WR-4A from bottom, facing north; #6: WR-4B, facing north along road; #7: Loadout below Shaft and Adit #6, sampled for XRF-L01; #8: WR-2 with loadout below Shaft #2, facing south; #9: WR-1, facing east. Video Tape No. 2

While investigating a nearby site during the 1994 Hazardous Materials Inventory, additional photos were taken at the Trout due to the poor quality of the 1993 site investigation photos. #19-20: TP-1 from the southeast corner facing northeast; #21: TP-1, mill, and dumps facing north-northeast; #22: Edge of TP-1, dump, and pit facing north; #23: New mill building, waste rock piles, tailings, and slopes of TP-1.

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: Shed north of Shaft #1 has 55 gallon drum 1/3 full of an unknown dark colored solid. Open transformer on ground south of Shaft #2 has no sign of oil stains below. Open transformer on ground east of little gem shaft has no sign of oil stains below.

General Comments on Potential Remedial Alternatives: Runon/Runoff control; grade, amend and revegetate waste materials.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): TROUT PA#: 20-062

Legal Description: T 7N ; R 13W ; Sec. 30 , NE 1/4 SE 1/4 1/4

County: GRANITE Mining District: PHILIPSBURG

Latitude: N 46° 19' 48" Longitude: W 113° 16' 05"

Primary Drainage Basin and Code: Cliff Gulch/17010202

Secondary Drainage Basin: Cliff Gulch

USGS Quadrangle map name(s): Philipsburg

Mine Type/Commodities: Hardrock/Gold, Silver, Lead, Zinc

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Granite Resource, 1029 Choteau, Helena, MT 59601. (406) 443-2510.

Relationship to other mines/sites in the area/district: Gem Mine was sampled as part of the Trout Mine (west end of the site); the former Salmon and Blackmail Mines may also have been sampled.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Fencing and signing on five shafts; culvert closures on two adits, one shaft; grate closure on one shaft by MDSL. The Philipsburg district is currently listed under the CECRA Program.

General site features: Elevation 5960' , Slope 20°-30° , Aspect Northwest

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ , Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 5 acres.
Dimensions:

Predominant vegetation types: Lodgepole pine, Douglas fir, willows, cottonwood, juniper, wildflowers on dumps

Access: roads - good ☐ , poor ☐ , 4wd ☒ , trail ☐ .
Other logistical considerations (proximity to other sites). Just before Algonquin mine (1/4 mi); near Scratch All and True Fissure

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Deposit type was silver bearing
replacement veins in sedimentary rocks. Site is underlain by
Philipsburg Batholith, limestone and shales. The site lies on the
headwaters of an unnamed dry drainage identified as Cliff Gulch in
previous investigations. Water leaving the site would flow
southwest; the unnamed tributary dissipates before Philipsburg or
flowing into Douglas Creek.

Mining/milling history, ore type/tenor, host rock, gangue: Trout
was discovered in 1864 and ore was originally milled at Northwest
Mill in Tower. Mine was idle in 1906, but the dumps were reworked
in 1907. Host rock appeared to be limestone, with ore as
fissure/fault fillings. A few pieces of pink intrusive found.
Gangue is composed of quartz, rhodochrosite, calcite and dolomite.
Metallic minerals are galena, zinc blende, pyrite, ruby silver and
gray copper.

Mine Operation?

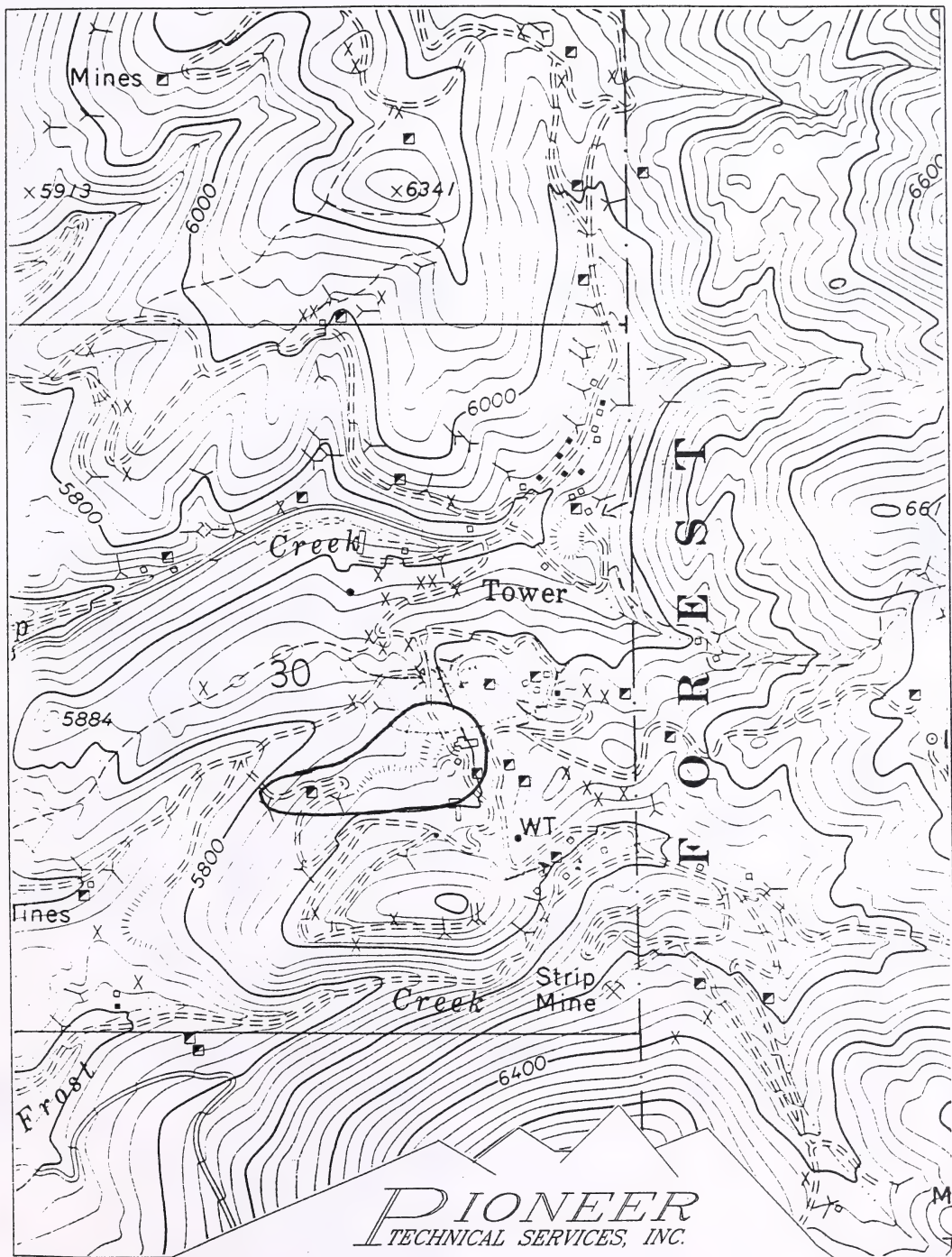
Shafts - Yes X, No , # 7, Comment 5 fenced; 1 grated; 1
open 15' deep
Adits - Yes X, No , # 10, Comment All but 1 collapsed;
culvert openings/fences
Pits - Yes X, No , # 1, Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three
questions:

Period(s) of Operation: Two mills; one older completely dis-
mantled, one newer mill structure that is still there

Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: Unknown

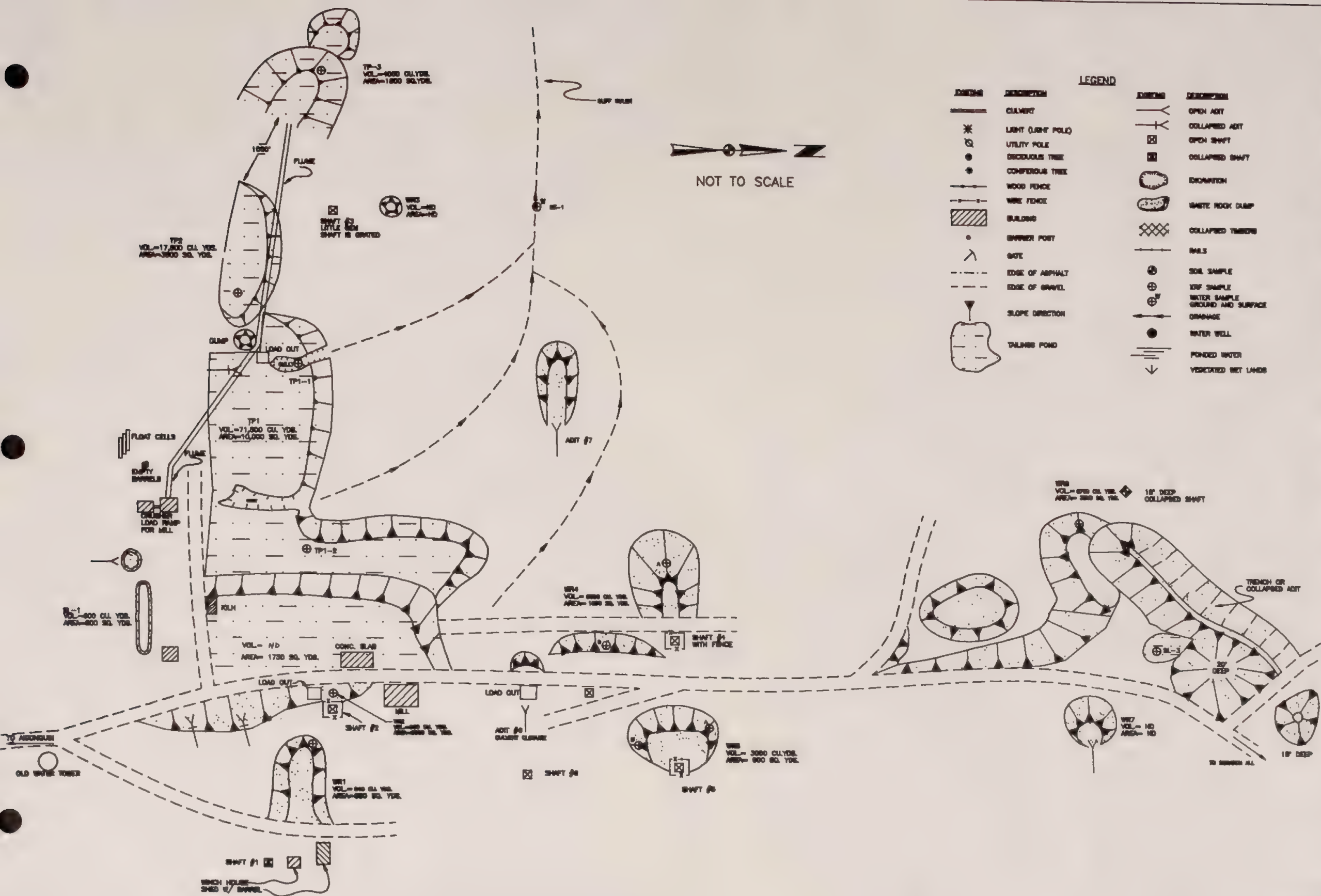
Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
Kiln; no information available



TROUT, P.A. NO. 20-062

T07N, R13W, SECTION 30

SCALE: 1" = 1000'



DRAWN: JTP
 DESIGNED: JTP
 DATE: 11 OCT 82
 JOB NO.: 93-17
 APPROVED: MUB
 F.B. NO.:

THOMAS, DEAN & HOSKINS INC.
 ENGINEERING CONSULTANTS
 GREAT FALLS-BOTZEMAN-VALLELL
 MONTANA WASHINGTON

PIONEER
 ENGINEERING

TDSH

MONTANA DEPT. OF STATE LANDS
 HAZARDOUS MATERIAL INVENTORY

TROUT PA# 20-062
 PHILIPSBURG DISTRICT GRANITE COUNTY

SHEET NO.:

20-062.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Primarily fine sand to silty sand

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Tailings piles range from 20 to 60 feet deep with no definite stratification observed.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): _____
Tailings are very dry on surface and moist at lower depths.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No engineered impoundments are present. Tailings were slurried over the hillside.

Comments on potential for mitigation: Grade, amend, and revegetate

SAMPLERS: Bullock, Flammang

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd ³)	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1	WR	940	Below Shaft #1; on knob	None	6.7 (D)	0.05	20-062-WR-1	06/21/93	T-Metals, ABA
WR-2	WR	500	30' north of loadout structure below Shaft #2	None	6.65 (D)	0.35			
WR-3	WR	ND	Below Little Gem Shaft on west side of property	None	NM	NM	20-062-WR-3	06/21/93	T-Metals, ABA
WR-4A	WR	5,000	Below Shaft #4; just off knob	None	7.0 (D)	0.03	20-062-WR-2	06/21/93	T-Metals, ABA
WR-4B	WR		South of Shaft #4; midway along pile towards top	None	6.95 (D)	0.035			
WR-5A	WR	3,000	Below Shaft #5	None	7.0 (D)	0.025			
WR-5B	WR		Below collapsed adit near Shaft #5	None	6.8 (D)	0.035	N/A	N/A	N/A
WR-6	WR	8,700	Associated with pit on east end of property	None	6.8 (D)	0.025			
TP-1-1A	TAIL	71,500	In erosion gully, west end; 0-4', dry fine sand	None	6.0 (D)	0.03			
TP-1-1B	TAIL		4-5', brown moist clay	None	4.5 (D)	0.04	20-062-TP-2	06/21/93	T-Metals, ABA, Cation/Anion
TP-1-1C	TAIL		10-14', moist silty sand	None	5.0 (D)	0.035			
TP-1-1D	TAIL		25-30', moist silty sand	None	5.5 (D)	0.03			
TP-1-1E	TAIL		40', salt precipitates	None	4.7 (D)	0.03	N/A	N/A	XRF Analysis
TP-1-2	TAIL		Borehole, east end; 6-9'	None	NM	NM			
TP-2	TAIL	17,500	West of TP-1	None	5.5 (D)	0.04	20-062-TP-1	06/21/93	T-Metals, ABA, Cation/Anion
TP-3	TAIL	4,000	West of TP-2	None	5.4 (D)	0.04			
LO-1	WR		Material in loadout below Shaft and Adit #6	Loadout Bin	7.0 (D)	0.03			
SL-1	SLAG		Dark material assoc. with old mill	None	5.8 (D)	0.04	20-062-SL-1	06/21/93	T-Metals, ABA
SL-2A	SLAG	1,750	Dark material assoc. with newer mill	None	6.2 (D)	0.04			
SL-2B	SLAG		Dark material assoc. with newer mill	None	5.9 (D)	0.03			
SL-3	SLAG		Dark material in pit at east end	None	6.7 (D)	0.045			

* Direct reading (Heavy Metal); S (Selected); P (Other Metal)

Comments or deviations from SOPs: 20-062-WR-1 is composite of WR-1, -2, and LO-1; 20-062-WR-2 is composite of WR-4A, -4B, -5, and -6; 20-062-WR-3 is grab of WR-3; 20-062-TP-1 is composite of TP-1-1A, -2, and -3; 20-062-TP-2 is composite of TP-1-1B through -1-1D, and -1-2. SL-1, -2A, -2B, and -3 were combined in equal amounts for 20-062-SL-1. ND = Not Determined; NM = Not Measured.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:_____

Filled shafts: Yes___, No X, Number:___ Identification:_____

Seeps/Springs: Yes___, No X, Number:___ Identification:_____

Groundwater wells within 4 miles?: Yes X, No___;

Number of well logs: 54

Distance to nearest well used for drinking? 1/4 mile to north

Sample types: Flowing adits (AD); filled shafts (SH);

Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___, Possible X, Unlikely___.

Water does run across TP-1 as evidenced by the large gullies present in the tailings; large uncontained sources (tailings, slag, waste rock) with elevated metal values.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes ☐, No ☒, Name(s): _____

Dry streambeds: Yes ☒, No ☐, Name(s): Cliff Gulch

Other surface water: Yes ☐, No ☒, Name(s)/Description: _____

Waste materials within any floodplain: Yes ☒, No ☐ Source ID(s): Erosion gullies in tailings constitute the headwaters of Cliff Gulch.

Approximate Flood frequency? ☒ 1 yr, ☐ 10 yr, ☐ 100 yr

Estimated seasonal flow of stream(s) (cfs)? _____

High Flow: 1 cfs, Average Flow: < 0.01 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; Erosion gullies are in tailings.

Surface water draining onto or through waste sources: Yes ☒, No ☐, Describe: Two large gullies (30-40' deep) have been cut through TP-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Drainage ends at Philipsburg; no evidence of connection with a perennial stream.

Observed erosional/sedimentation/stream turbidity problems? Yes ☒, No ☐, Distance downstream (ft)? 1000+ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Sediments showing elevated metal values; tailings material visible in stream sediments.

SAMPLERS: Bullock

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No parameters due to dry stream.

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ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Flammang

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (12187)	MOISTURE CONTENT (NIST D157/10421.04)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL OBSERVED/HIGH/NO RATE/LOW/NONE
TP-1	pH; ESD	Dry	90,000	85,500	Yes	Observed/High
TP-2	None	Dry	31,500	31,500	Yes	Observed/High
TP-3	None	Dry	13,500	13,500	Yes	Observed/High
SL-1	None	Dry	5,400	5,400	Yes	Moderate
SL-2	None	Dry	15,750	15,750	Yes	Moderate
SL-3	None	Dry	3,000	2,250	Yes	Low
WR-1	None	Dry	5,220	4,700	Yes	Low
WR-2	None	Dry	27,000	20,250	Yes	Low
WR-3	None	Dry	ND	ND	Yes	Low
WR-4	None	Dry	13,500	13,500	Yes	Low
WR-5	None	Dry	8,100	7,290	Yes	Low
WR-6	None	Dry	31,500	25,200	Yes	Low

Notes and Clarifications: ND = Not Determined

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe: _____

Population within 1 mile: 1-10____; 10-30____; 30-100____; 100-300____;
300-1,000 X; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments _____

Evidence of recreational use on site: Yes X, No____, Describe: TP-1
has motor bike tracks, hills on tailings with trails; beer cans; road
goes right through site.

Accessibility - Fences, warning signs, closed roads? Fences, signs,
and grates on all but 2 HMOs, otherwise unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes____, No X, Comment _____
Wilderness Area - Yes____, No X, Comment _____
T&E Species Habitat - Yes X, No____, Comment Bald Eagle
Bat Habitat - Yes____, No X, Comment _____

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality - High____, Medium X, Low____
Wetlands Frontage - High____, Medium X, Low____
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 3

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 17, types and locations:____
Five fenced shafts, one grated shaft, one shaft open on west side of
site approx. 15' deep with steep sides; 10 adits, all but one is
collapsed, fenced, or has culvert opening, one adit is by TP-3

Hazardous structures: Yes X, No____, Number 11, types and locations:____
Four loadouts associated with Shaft #6, #2, Little Gem Shaft, and
Adit #3

Unstable highwalls, pits, trenches, slopes: Yes X, No____, Number 1,
types and locations: Pit with approx. 20 feet highwall on north end of
site

Unstable waste piles, impoundments, undercut banks: Yes X, No____,
Number 6, types and locations: WR-1 and 4 are steep, unvegetated, and
at angle of repose. TP-1, -2, and -3 are all steep; TP-1 has
oversteepened gullies.

Fire and/or Explosion hazards: Yes____, No X, Explain: _____

Bibliography

MBMG, Well Log Database, September 8, 1993.

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MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Trout, Prepared by Northern Engineering and Testing, September 2, 1987.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle, Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Map, Philipsburg, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

TROUT
PA NO. 20-062

Trout PA# 20-062
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/22/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	Cyanide (mg/Kg)
20-062-SE-1	303 J	2540	21.8	2.7	20.2	274	16800	1.23 JX	28300	131	2900	21 J	11200	NR
20-062-SL-1	663 J	507	7.2	2.6	17.7	47.2	17400	0.892 JX	97200	387	1240	10 J	4850	NR
20-062-TP-1	95 J	547	6.5	1.2 U	8.5	156	8690	0.412 JX	16900	79	946	5 J	3090	NR
20-062-TP-2	285 J	1340	26.7	7.1	24	376	21400	1.83 JX	19500	110	2780	33 J	14500	NR
20-062-WR-1	615 J	215	3.1	4.9	30.2	38.9	19300	0.335 JX	154000	723	198	7 J	1170	NR
20-062-WR-2	218 J	605	19.1	0.8 U	5.8	223	3990	2.51 JX	25800	111	3680	28 J	11200	NR
20-062-WR-3	10 J	39.5	9.8	4.7	14.7	323	15600	0.054 JX	591	12	13	4 UJ	1480	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE u/1000r	NEUTRAL POTENT. u/1000r	SULFUR ACID BASE POTENT. u/1000r	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE u/1000r	SULFUR ACID BASE POTENT. u/1000r
20-062-SL-1	<0.01	0	187	187	<0.01	<0.01	0.05	0	187
20-062-SL-1DUP	<0.01	0	177	177	<0.01	0.01	0.05	0.31	177
20-062-TP-1	0.92	28.7	98	69.2	0.22	0.53	0.17	16.6	81.4
20-062-TP-2	2.17	67.8	129	61.4	<0.01	1.88	0.38	56.7	70.4
20-062-WR-1	<0.01	0	469	469	<0.01	<0.01	0.02	0	469
20-062-WR-2	<0.01	0	908	908	<0.01	<0.01	0.02	0	908
20-062-WR-3	1.8	56.2	168	112	0.02	0.77	1.01	24.1	144

Cation Exchange Capacity

FIELD ID	milliequivalents/100g
20-062-SL-1	4.19
20-062-TP-1	0.62
20-062-TP-2	3.79

LEGEND

SE1 - Downgradient sediment sample in Cliff Gulch.
SL1 - Dark material associated with old mill. Composite of subsamples SL-1, 2A, 2B, and 3.
TP1 - Composite of subsamples TP1-1A, 2, and 3.
TP2 - Composite of subsamples TP1-1B, 1C, 1D, and 2D.
WR1 - Composite of subsamples WR1, 2, and LOW1.
WR2 - Composite of subsamples WR4A, 4B, 5, and 6.
WR3 - Sample of the subsample WR3.
BACKGROUND - From the Granite Mountain Mine (20-110-SS-1).
SL1DUP - Duplicate of the sample 20-062-SL1.

U - Not Detected, J - Estimated Quantity X - Outlier for Accuracy or Precision, NR - Not Requested



XRF ANALYSIS RESULTS

**TROUT
PA NO. 20-062**

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-062-LO-1			90418.6	113.689 *		174550	21700.3			1847.03	246.85	112.235
20-062-SE-1000			82841.5	704.44		39960.5	9863.06			6010.56	95.6767 *	204.447
20-062-SE-500			32080.8	706.602		50375.1	11190.6			6916.34	175.802 *	256.458
20-062-SL2-A			30848.8	637.026	109.716 *	74139.7	13908.7			3139.93	355.913	204.319
20-062-SL2-B			43077.3	863.145		115405	18122.9			3395.19	819.991	326.051
20-062-SL-1			32401.3	490.284		126408	15390.4			7181.39	321.056 *	300.326
20-062-SL-1-COMP			30720.5	579.434		107789	16298.1			3685.69	576.18	301.377
20-062-SL-3			16664.5	1087.21		126417	26259.9			2112.19	1274.45	413.278
20-062-TP-1-2			8844.97	974.268		19459.3	11238.8		175.184 *	6148.37		405.094
20-062-TP1-A			27984.3	489.113		27381.4	7039.29		70.3662 *	3160.43		168.266
20-062-TP1-B			31284	1884.99		33125.9	18030.2		581.188	9432.26	362.857 *	257.286
20-062-TP1-C			11676.6	1334.82		12265.5	19976.1		112.385 *	9807.81		466.654
20-062-TP1-D			20799.4	1471.47	119.273 *	25095.4	18003.8		182.536 *	2953.28		486.419
20-062-TP1-E			22026	478.794		25630.7	8327.02			4903.76		237.189
20-062-TP-1-COMP			13447.2	522.01		13775.7	6488.78			1643.53		264.923
20-062-TP-2			5598.49	586.557		3719.5	6512.54		67.9581 *	637.752		337.911
20-062-TP-2-COMP			20147.3	1339.57		24915.4	17784.1		229.835 *	5360.23		505.734
20-062-TP-3			6031.22	479.255		4364.5	4461.22			957.001		156.299
20-062-WR4-A			132154	286.892 *		20464.5	5610.11		320.325	15514.2		94.9653
20-062-WR4-B			169621	82.1386 *		12075.3	2521.84			4476.57		203.571
20-062-WR-1			10662.8	576.65	97.1015 *	368883	31369.9			555.763	1275.2	168.358
20-062-WR-1-COMP			34846.9	406.446	170.203 *	308312	27685.2			1191.1	1090.81	170.382
20-062-WR-2			94137.2	536.973		19298.6	11938			1395.63		60.6254
20-062-WR-2-COMP			159966	236.624 *		10629.5	3011.08			6876.86		60.7812
20-062-WR-3			79203.9	1636.58		1336.63	21879.3	280.209 *	124.498 *	1911.23		66.3378
20-062-WR-5			166932	85.1606 *		1573.88	2077.9			226.392	28.4576 *	34.4179
20-062-WR-6			167702	187.925 *		5025.15	2619.26			314.068		52.3528

XRF SAMPLE ID	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
20-062-LO-1			22.9631	167.234	41.1321 *				176.207 *		
20-062-SE-1000	59.2229		4.75989 *	1028.22	25.9395 *			675.282	313.01 *		
20-062-SE-500	74.5675		6.61141 *	1599.43	50.6522 *		37.2851 *	775.581	264.168 *		
20-062-SL2-A	39.5255		5.69606 *	598.256	42.0111 *			302.232	158.836 *		
20-062-SL2-B	73.7279		9.38439 *	903.412	81.4619			204.753	162.522 *		
20-062-SL-1	45.5563		949.901	844.069	47.3462 *		40.245 *	500.902	290.388 *		
20-062-SL-1-COMP	53.3067			844.069	73.4333		30.623 *	301.494	416.026 *		
20-062-SL-3	79.8042			447.752	131.82			231.565	289.085 *		
20-062-TP-1-2	90.1686			1184.84	81.9213			4094.21	248.63 *		10.1365
20-062-TP1-A	63.9919			903.061	18.0577 *		41.7084 *	497.412	328.532 *		
20-062-TP1-B	112.537			3674.94	87.8093		47.1307 *	614.874	453.746 *		
20-062-TP1-C	117.407			1622.52	78.8887		51.01 *	1285.92	513.657 *		
20-062-TP1-D	107.145			1569.42	77.5756		55.287 *	1324.55	253.62 *		
20-062-TP1-E	67.107		3.8159 *	1056.12	24.0716 *			451.85			
20-062-TP-1-COMP	123.833			590.622	44.2757			651.113	170.748 *		
20-062-TP-2	123.037			523.991	41.3262			499.863			
20-062-TP-2-COMP	92.8798			2035.09	75.5924		50.6713 *	1631.97	401.222 *		
20-062-TP-3	179.715		6.35064 *	5144.82	38.9792			1111.28			
20-062-WR4-A	15.6455 *			262.697			56.5502 *	557.049	469.152 *		
20-062-WR4-B								87.4139			
20-062-WR-1	62.1086		7.16478 *	80.9385 *	50.5443 *		36.1427 *	88.5332	365.77 *		
20-062-WR-1-COMP	40.0468		8.55079 *	129.567	70.1522 *		36.1263 *	181.853	184.753 *		
20-062-WR-2	17.7403							178.545			
20-062-WR-2-COMP	11.967 *		5.21633 *	1037.47				114.005			
20-062-WR-3	144.208		42.2193		84.7166						
20-062-WR-5								567.852			
20-062-WR-6	27.6722			25.7882 *							

* - Estimated Quantity
\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

TROUT
PA NO. 20-062

AIMSS SCORESHEET

SITE NAME:

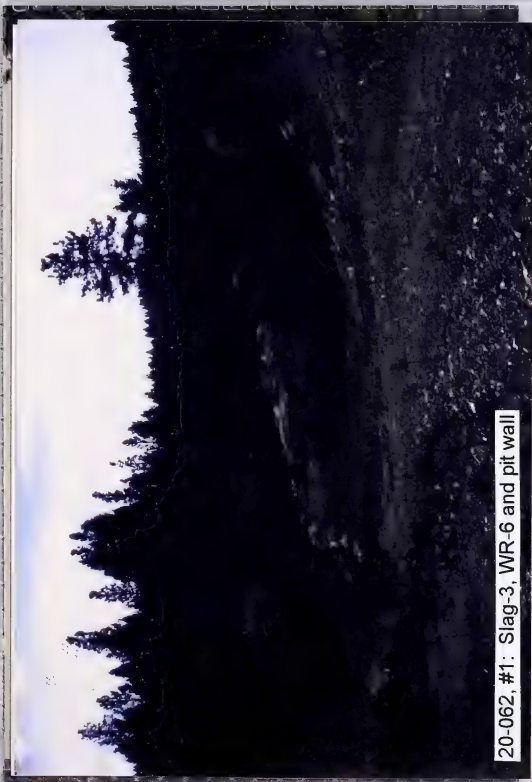
TROUT

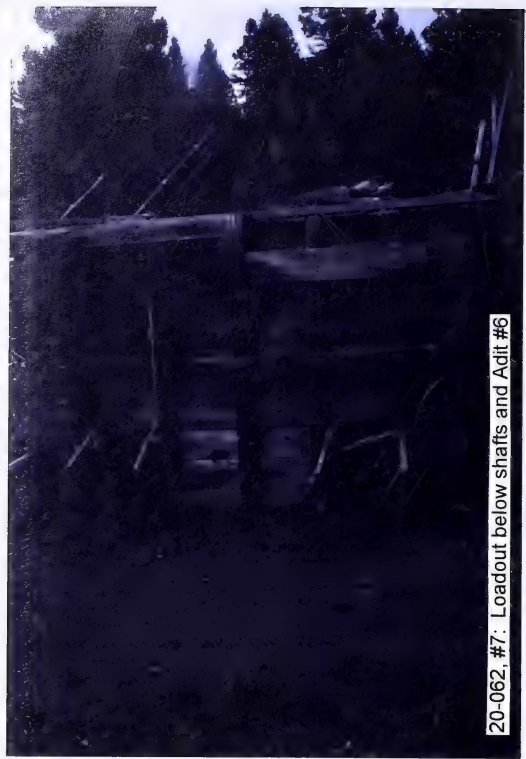
PA NUMBER:

20-062

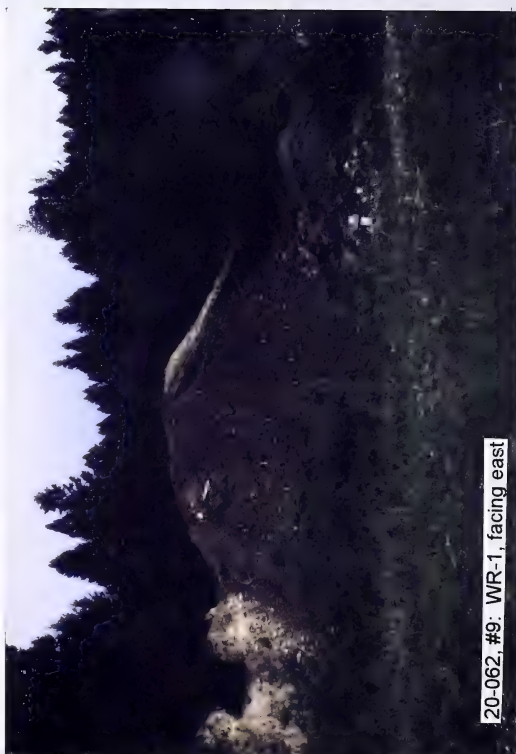
LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	17.5
7	GW - TARGETS	WELLS - 1 TO 4 MI	47
8		NEAREST WELL	5
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9
			4821382
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD	EXCEEDENCES	0
13A	OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	1
18	SW - TARGETS	WETLANDS	0
19		FISHERY	1
20		RECREATION	0
21		IRRIGATION/STOCK	0
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 - 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23
			531087
		AIR PATHWAY	
25		OBSERVED RELEASE	200
26A	AIR - LIKELIHOOD	CONTAINMENT	20
26B	OF RELEASE	DISTANCE TO POPULATION	10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	300
30		NEAREST RESIDENCE	5
31	AIR - TARGETS	WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 - 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34
			259712
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF	ACCESSIBILITY	20
37B	EXPOSURE	DISTANCE TO POPULATION	10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT	POPULATION - 1 MILE	300
41	TARGETS	NEAREST RESIDENCE	5
42		RECREATIONAL USE	10
43		TARGETS SCORE	SUM LINES 40 - 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
			147578
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		
	(LINES 10 + 24 + 35 + 44) / 100,000		57.60

LINE NO.			SITE NAME:	TROUT
			PA NUMBER:	20-062
1	SITE SAFETY			
2	THREAT	ACCESSIBILITY		20
3		OPEN SHAFTS	100 EA.	100
4	HAZARDS	OPEN ADITS	50 EA.	50
5		UNSTAB. HIWALLS / PITS	75 EA.	75
6		HAZ. STRUCTURES	40 EA.	440
7		EXPLOSIVES		0
8		HAZ. MATERIALS		100
9		HAZARDS SCORE	SUM LINES 2 - 7	765
10	TARGETS	POPULATION - 1 MILE		300
11		NEAREST RESIDENCE		5
12		RECREATIONAL USE		10
13		TARGETS SCORE	SUM LINES 9 - 11	315
		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	4819.50





20-062, #7: Loadout below shafts and Adit #6



20-062, #9: WR-1, facing east



20-062, #6: WR-4B



20-062, #8: WR-2 with loadout below Shaft #2, facing south



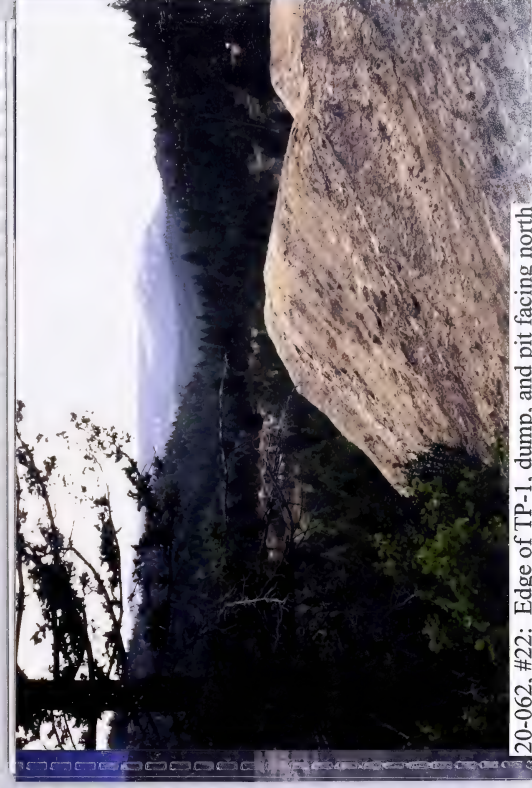
20-062, #19: TP-1 from the southeast corner facing
northeast



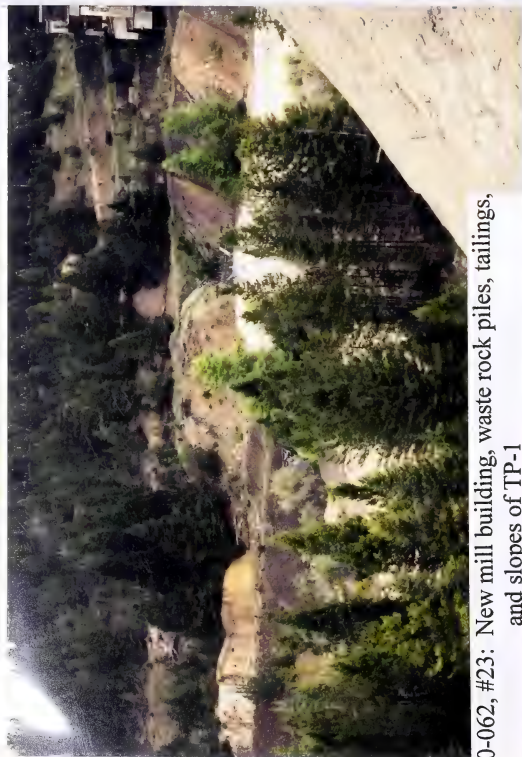
20-062, #20: TP-1 from the southeast corner facing
northeast



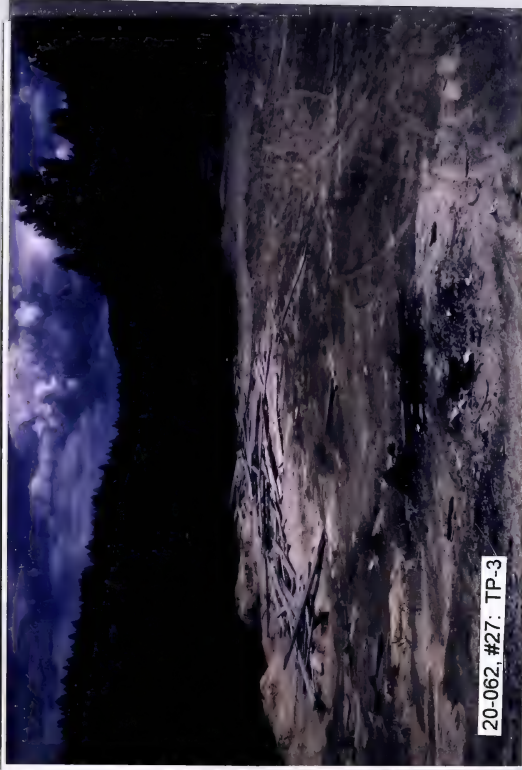
20-062, #21: TP-1, mill, and dumps facing north-northeast



20-062, #22: Edge of TP-1, dump, and pit facing north



20-062, #23: New mill building, waste rock piles, tailings, and slopes of TP-1



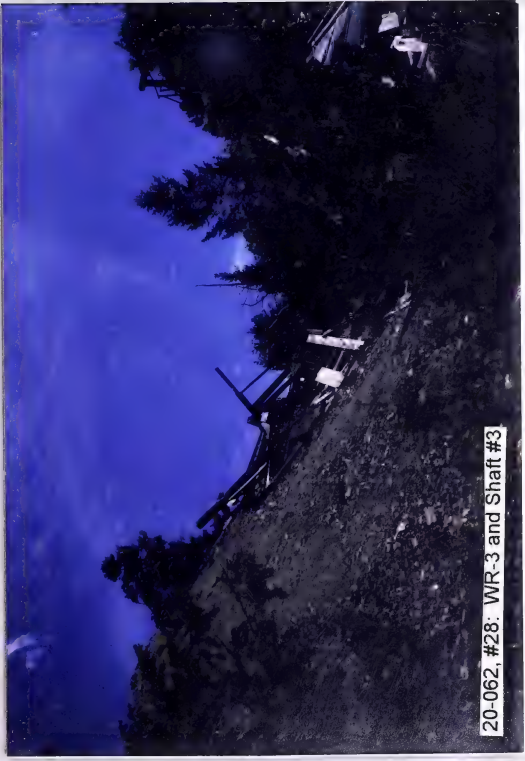
20-062, #27: TP-3



20-062, #29: TP-2



20-062, #26: TP-3



20-062, #28: WR-3 and Shaft #3



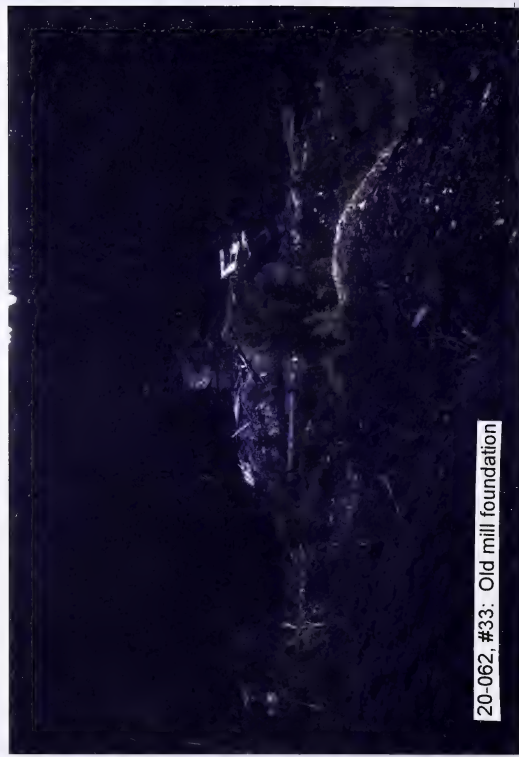
20-062, #30: Dry drainage through TP-1



20-062, #31: TP-1



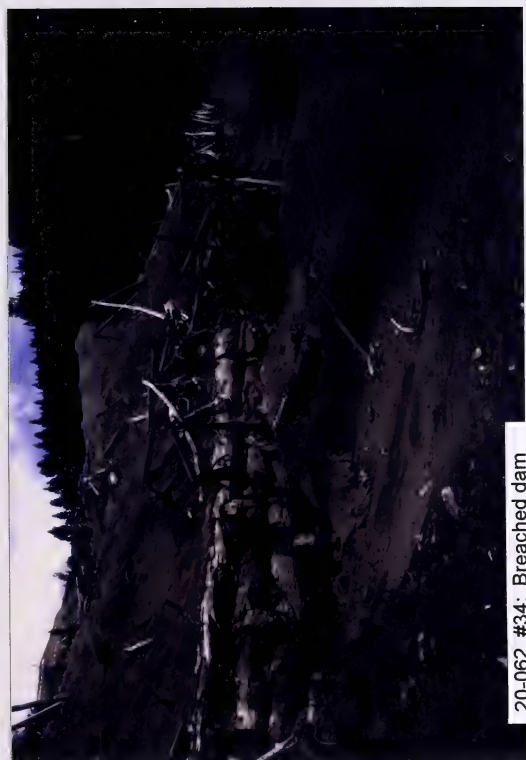
20-062, #32: Newer mill at site



20-062, #33: Old mill foundation



20-062, #35: Adit #7 (unfenced)



20-062, #34: Breached dam

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: GRANITE MOUNTAIN PA#: 20-110

Date: June 22, 1993 Time: 0900

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Cloudy; snowing; cold; wind blowing; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #15-#18: WR-1, mill (north), and building (south). Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Waste Rock Dump #1 is a series of several separate mounds. This dump was also bulldozed which left the face of the dump spread all over. Access to the site was by truck. No water found flowing adjacent to or on the site. Rock foundation at top of site is believed to be a mill, but no tailings were observed below. Tailings were flumed down the drainage to Douglas Creek Tailings (20-003). The division line between the Granite Mountain site and the Bimetallic site (20-002) was made on road which goes through gate and adjacent to tin building and the large headframe. Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Large, steep dump should be recontoured and revegetated. Tailings pond is small with high arsenic levels; may require treatment to immobilize arsenic.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): GRANITE MOUNTAIN PA#: 20-110

Legal Description: T 7N ; R 13W ; Sec. 32 , NE1/4 SE1/4 1/4

County: GRANITE Mining District: PHILIPSBURG

Latitude: N 46° 18' 55" to 19' 05"

Longitude: W 113° 14' 20" to 14' 50"

Primary Drainage Basin and Code: Flint Creek/17010202

Secondary Drainage Basin: Douglas Creek

USGS Quadrangle map name(s): Fred Burr Lake/Philipsburg

Mine Type/Commodities: Hardrock/Silver, Gold, Lead

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): Hope Resources,
Box 791, Butte, MT 59702. (406) 443-2510; Deerlodge National
Forest.

Relationship to other mines/sites in the area/district: Same
deposit type as Bi-Metallic; developed simultaneously after 1898
and is located on the same ore shoot.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? Shaft has been fenced by MDSL. The
Philipsburg district is currently listed under the CECRA Program.

General site features: Elevation 7000' , Slope 10°-14° ,
Aspect Southwest

Land use: Mining X , Recreational X , Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? 7.3 acres.
Dimensions: 800 feet x 400 feet

Predominant vegetation types: Lodgepole pine, grasses, willows

Access: roads - good X , poor , 4wd , trail .
Other logistical considerations (proximity to other sites).
Directly above the Bi-Metallic mine and mill

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MRMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Site is underlain by granodiorite of
Philipsburg Batholith. Deposit is vein filling in fissures. The
site lies above the headwater area of Douglas Creek. Water leaving
the site would flow to the southwest and then west to Douglas
Creek.

Mining/milling history, ore type/tenor, host rock, gangue: The
site was first located in 1872. In the 1880's and 1890's ore
averaged higher than 150 oz./ton Ag. In 1905, it shut down and
then reopened and worked above drain tunnel in Douglas Creek
canyon. The dumps were reworked in 1906. A gangue of quartz,
rhodochrosite, rhodonite, barite, and calcite carrying pyrite,
arsenopyrite, stibnite, tetrahedrite, tennantite, galena,
sphalerite, ruby, silver, and others.

Mine Operation?

Shafts - Yes X, No , # 1, Comment Fenced; caved
Adits - Yes , No X, # , Comment
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three
questions:

Period(s) of Operation: Unknown

Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: Ore was possibly milled
here from Granite Mountain; some from Bi-Metallic.

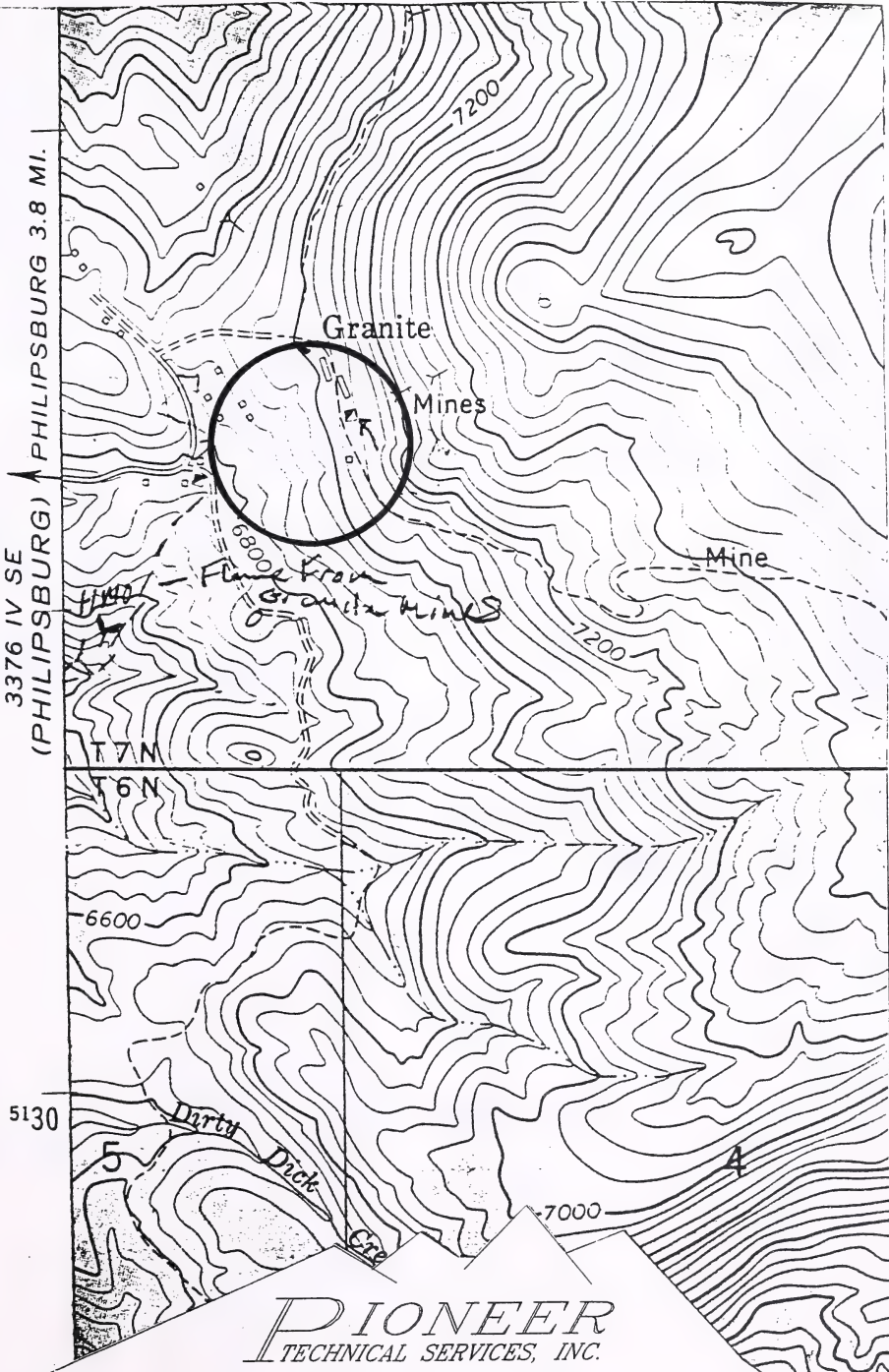
Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
Appears to have been floatation; reported in literature as
chloridizing roasting and pan amalgamation. Mills A and B at
Granite were dry-stamp, salt-roasting, pan amalgamation plant and
had combined 80 stamps. In the early 1890's, 280 stamps were
combined from Granite and Bi-Metallic. A concentrator was built in
1900. Richest concentrates were sent to a smelter, but lower grade
ones worked at the site. During 1906, an experimental cyanide
plant was installed to treat tailings.

Montana Bureau of Mines and Geology
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
m:55947	07N 13W 28 DBBB	9.0	11.0	4.00

3376 IV SE
(PHILIPSBURG) PHILIPSBURG 3.8 MI.



PIONEER
TECHNICAL SERVICES, INC.

GRANITE MOUNTAIN, P.A. NO. 20-110

T07N, R13W, SECTION 32

SCALE: 1" = 1000'

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): TP-1 is piles of small (1/2") rocks and sand; appears to be processed and may not be tailings. TP-2 is a small pond of clay/silt fines and may be from experimental process.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): TP-2 is 4 feet deep with no stratification.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): TP-2 (natural basin) is moist.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundments for most tailings. TP-2 has been dug up and moved around.

Comments on potential for mitigation: Drainage tailings are vegetated down drainage to Douglas Creek. Small amount in TP-2 may need treatment for arsenic.

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Belanger, Lasher

[illegible]^a D-Direct reading (Railway Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 20-110-WR-1 is a composite of WR-1A through -1E. 20-110-TP-2 is grab of TP-2.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:___

Filled shafts: Yes___, No X, Number:___ Identification:___

Seeps/Springs: Yes X, No___, Number: 1 Identification: North side of site

Groundwater wells within 4 miles?: Yes X, No___;

Number of well logs: 76

Distance to nearest well used for drinking? The town of Philipsburg is approx. 2 miles (west and north) from site.

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___, Possible X, Unlikely___.

Site lies in a drainage basin. Metal values (particularly arsenic) in dumps are elevated (large, uncontained source).

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes ☐, No ☒, Name(s): None through site

Dry streambeds: Yes ☒, No ☐, Name(s): Tributary/headwater of Douglas Creek

Other surface water: Yes ☐, No ☒, Name(s)/Description: _____

Waste materials within any floodplain: Yes ☐, No ☒ Source ID(s): _____

Approximate Flood frequency? ☐ 1 yr, ☐ 10 yr, ☐ 100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow: _____, Average Flow: _____

Distance between waste source(s) and nearest surface water body (ft)? 200 feet

Surface water draining onto or through waste sources: Yes ☐, No ☒, Describe: _____

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Irrigation, wetlands, and recreation

Observed erosional/sedimentation/stream turbidity problems? Yes ☒, No ☐, Distance downstream (ft)? 1 mi. Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Tailings down drainage to Douglas Creek.

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? < 5 acres

Wetlands present: Yes , No X, Describe:

Carbonate rocks/soils: Yes , No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 ;
100-300 ; 300-1,000 ; 1,000-3,000 X; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
 observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

[illegible]

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe: _____

Population within 1 mile: 1-10____; 10-30____; 30-100____; 100-300____;
300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments None

Evidence of recreational use on site: Yes X, No____, Describe:
Historic townsite located to the north.

Accessibility - Fences, warning signs, closed roads? Fence at shaft;
gate on lower access.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes____, No X, Comment_____
Wilderness Area - Yes____, No X, Comment_____
T&E Species Habitat - Yes X, No____, Comment Bald Eagle
Bat Habitat - Yes____, No X, Comment_____

Primary Drainage____; Secondary Drainage X; No Information____:

Riparian Habitat Quality - High____, Medium X, Low____
Wetlands Frontage - High____, Medium X, Low____
Fisheries Habitat and Species Classification - 1
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No____, Number 1, types and locations:____
Fenced shaft

Hazardous structures: Yes ?, No____, Number____, types and locations:____
Mill

Unstable highwalls, pits, trenches, slopes: Yes X, No____, Number____,
types and locations: Highwall at top of hill

Unstable waste piles, impoundments, undercut banks: Yes X, No____,
Number____, types and locations: Steep piles

Fire and/or Explosion hazards: Yes____, No X, Explain:_____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Granite Mountain, Prepared by Northern Engineering and Testing, September 3, 1987.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle, Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Map, Fred Burr Lake and Philipsburg, Montana, 7 1/2 minute Quadrangles, 1971.

LABORATORY ANALYTICAL DATA

GRANITE MOUNTAIN
PA NO. 20-110

SOLID MATRIX ANALYSES

Metals in soils
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-110-TP-2	55000 J	98.4	38.3	4.9	10.4	1560	298000	4.58 JX	1990	11	1240	224 J	7920	0.737
20-110-WR-1	3420 J	232	1.3	4.3	1.8	52.9	21200	1.67 JX	1090	6	315	28 J	289	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR t/1000	NEUTRAL POTENT. t/1000	SULFUR ACID BASE t/1000	SULFUR POTENT. t/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE t/1000	SULFUR ACID BASE t/1000	SULFUR POTENT. t/1000
20-110-TP-2	0.72	22.5	-2.3	-24.	0.1	0.47	0.15	14.7	-17	2.02
20-110-WR-1DUF	0.43	13.4	2.02	-11.	0.34	<0.01	0.09	0	0	2.06
20-110-WR-1	0.41	12.8	2.37	-10.	0.31	0.01	0.09	0.31	0.31	2.06

LEGEND

TP2 - Sample of the TP2 sub-sample

WR1 - Composite of WR1A, 1B, 1C, 1D, and 1E.

BACKGROUND - From Granite Mountain Mine (20-110-SS-1).

WR1DUP - Duplicate of sample 20-110-WR-1.

XRF ANALYSIS RESULTS

**GRANITE MOUNTAIN
PA NO. 20-110**

Results in PPM

* – Estimated Quantity
\$ – Unvalidated Data

\$ - Unvalidated Data

**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**GRANITE MOUNTAIN
PA NO. 20-110**

AIMSS SCORESHEET

SITE NAME: GRANITE MOUNTAIN
PA NUMBER: 20-110

LINE NO.			
GROUNDWATER PATHWAY			
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 117.475
6	GW - TARGETS	WELLS - 1 MI. x 2.5	2.5
7		WELLS - 1 TO 4 MI	75
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 77.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 3641725
SURFACE WATER PATHWAY			
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 118.831
16	SW - TARGETS	DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	5
18		WETLANDS	10
19		FISHERY	20
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 - 22 47
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 223402
AIR PATHWAY			
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	15
26B		DISTANCE TO POPULATION	0
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 4.341
29	AIR - TARGETS	POPULATION - 4 MILES	1000
30		NEAREST RESIDENCE	0
31		WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 - 33 1015
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 0
DIRECT CONTACT PATHWAY			
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	0
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 4.292
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	0
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	5
43		TARGETS SCORE	SUM LINES 40 - 42 5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 1073
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000		
			38.66

LINE
NO.

SITE NAME:

GRANITE MOUNTAIN

PA NUMBER:

20-110

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	215
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	5
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	21.50



20-110, #15: WR-1, mill and building



20-110, #16: WR-1, mill and building



20-110, #17: WR-1, mill and building



20-110, #18: WR-1, mill and building

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: TRUE FISSURE PA#: 20-111

Date: June 23, 1993 Time: 1530-1900

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Windy; cold; occasional snow;
cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #9: WR-2; #10: WR-3;
#11: Shaft HMO; #12: WR-1; #13: WR-4. No video taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site was by truck. One residence is located right below
WR-1. A small stream is flowing next to the house; residence
appears to be upgradient. All area above and below the site are
affected by some sort of disturbances.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Unsteepen
dumps and revegetate; remove structures; fill in shaft pit.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): TRUE FISSURE PA#: 20-111

Legal Description: T 7N ; R 13W ; Sec. 30 , NE1/4 SE1/4 1/4

County: GRANITE Mining District: PHILIPSBURG

Latitude: N 46° 19' 32" Longitude: W 113° 16' 00"

Primary Drainage Basin and Code: Douglas Creek/17010202

Secondary Drainage Basin: Camp Creek

USGS Quadrangle map name(s): Philipsburg

Mine Type/Commodities: Hardrock/Silver, Manganese, Lead, Zinc

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Taylor Knapp, Taylor Knapp Co., General Delivery, Philipsburg, MT 59858. (406) 859-3231.

Relationship to other mines/sites in the area/district: Same vein as the Midnight and Imperial Chief veins, which are most likely a continuation of the True Fissure vein.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Shaft has been fenced and adit has been closed by DSL. The Philipsburg district is listed under the CECRA Program.

General site features: Elevation 5840' , Slope 20°-25° , Aspect Northwest

Land use: Mining ☐ , Recreational ☒ , Residential ☒ , Urban ☐ , Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 2.2 acres.
Dimensions:

Predominant vegetation types: Pine, grasses, raspberry bushes

Access: roads - good ☒ , poor ☐ , 4wd ☐ , trail ☐ .
Other logistical considerations (proximity to other sites). Near the Trout (20-062) and Scratch All (20-019) sites.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MBMG Well Log Printout(s): There are 7 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Site is underlain by limestone of the Red
Lion Formation and the Jefferson Limestone, which is in contact
with granite. Deposit type is silver-bearing replacement vein in
sedimentary host. Site lies on the southeast side of the
intermittent drainage, Camp Creek, which flows southwest past the
site.

Mining/milling history, ore type/tenor, host rock, gangue: Gangue
minerals include quartz, rhodochrosite, calcite, and dolomite.
Metallic minerals are galena, zincblende, pyrite, ruby silver, and
gray copper, manganese compounds in oxidized ore.

Mine Operation?

Shafts - Yes X, No , # 1, Comment Fenced; full of timbers
Adits - Yes X, No , # 2, Comment Collapsed or dozed
Pits - Yes , No X, # , Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes , No X. If yes answer the next three
questions:

Period(s) of Operation: N/A

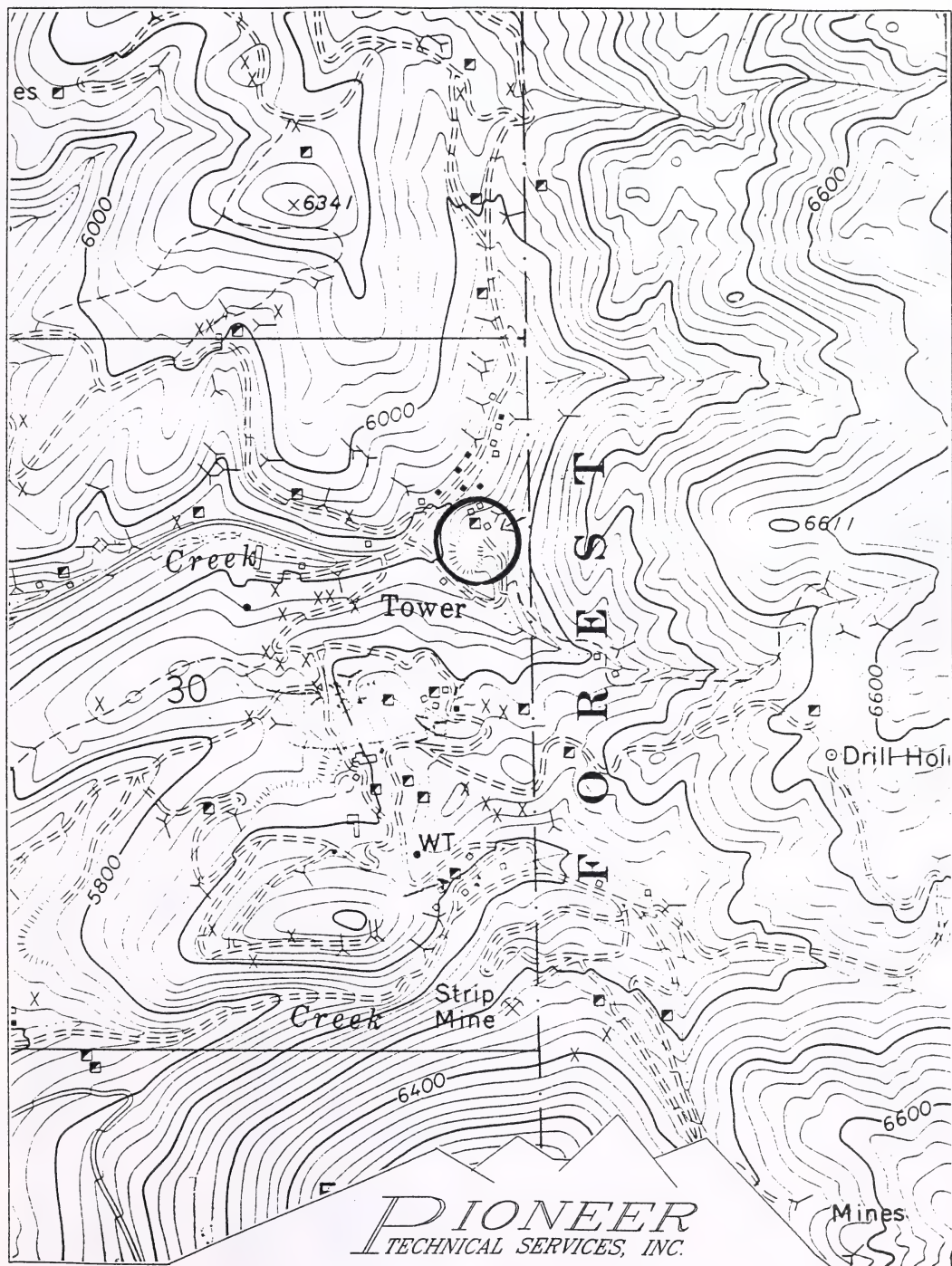
Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
M:55960	07N 14W 25	192.0	0.0	0.00
M:55961	07N 14W 25	35.0	20.0	0.00
M:55980	07N 14W 36 BA	90.0	0.0	38.00
M:55981	07N 14W 36 BADD	125.0	0.0	0.00
M:55982	07N 14W 36 CA	40.0	7.0	20.00
M:55983	07N 14W 36 CACC	68.0	20.0	48.00
M:55984	07N 14W 36 CC	48.0	4.0	11.00



TRUE FISSURE, P.A. NO. 20-111



T07N, R13W, SECTION 30

SCALE: 1" = 1000'



- | | | |
|--|--|---|
| MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

TRUE FISSURE PA# 20-111

PHILIPSBURG DISTRICT GRANITE COUNTY | 
 | DRAIN DESIGNED JTP DATE 11 OCT 83
IPR JOB NO. 93-17
APPROVED WJB F.B. NO. |
| | | THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS - BOZEMAN - KALISPELL
SPOKANE - WASHINGTON |

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SAMPLERS: Tuesday, Belanger

[illegible]

P-Direct seedling (Kelway Master); B-Saturated Paste (Orion Master)

MDSL AMRB/PIONEER 4/9/93

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:_____

Filled shafts: Yes___, No X, Number:___ Identification:_____

Seeps/Springs: Yes___, No X, Number:___ Identification:_____

Groundwater wells within 4 miles?: Yes X, No___;

Number of well logs: 65

Distance to nearest well used for drinking? < 200 feet

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___, Possible X, Unlikely___.

Possible groundwater contamination due to uncontained dumps and constituents within the dump.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Trickle in Camp Creek
< 1/2 cfs

Dry streambeds: Yes X, No , Name(s): Tributary to Camp Creek;
road is creek.

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s):
WR-1 is in unnamed tributary.

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? < 0.5 during investigation
High Flow: 2.0 cfs, Average Flow: 0.5 cfs

Distance between waste source(s) and nearest surface water body (ft)?
30 feet between WR-4 and Camp Creek.

Surface water draining onto or through waste sources: Yes , No X,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Possible irrigation, wetlands, recreation

Observed erosional/sedimentation/stream turbidity problems? Yes ,
No X, Distance downstream (ft)? Describe/explain (Note streambank
stability and condition of streambank vegetation and any manmade structures or channel changes present):

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO₃)
Presence of evaporative salt deposits? (ESD)
Discolored or turbid seepage? (SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?
Presence of ferric hydroxide precipitates? (FEOX)
Presence of burned or stressed vegetation? (VEG)
pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 1 to 2 acres

Wetlands present: Yes , No X, Describe:

Carbonate rocks/soils: Yes X, No , Describe: Limestones in dump.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 ; 30-100 ;
100-300 ; 300-1,000 ; 1,000-3,000 X; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 50 feet

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

SAMPLERS: Tuesday, Belanger

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No ,
Describe: Residence at base of WR-1.

Population within 1 mile: 1-10 ; 10-30 ; 30-100 X; 100-300 ;
300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ;
Comments

Evidence of recreational use on site: Yes X, No , Describe: Beer
cans, campfire rings, shotgun shell casings

Accessibility - Fences, warning signs, closed roads? Fence around
shaft; debris in shaft.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes , No X, Comment
Wilderness Area - Yes , No X, Comment
T&E Species Habitat - Yes X, No , Comment Bald Eagle
Bat Habitat - Yes , No X, Comment

Primary Drainage ; Secondary Drainage X; No Information :

Riparian Habitat Quality - High , Medium X, Low
Wetlands Frontage - High , Medium X, Low
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No , Number 1, types and locations:
One adit has been closed. Shaft is fenced and has a collapsed
headframe, but is still hazardous.

Hazardous structures: Yes X, No , Number 2, types and locations:
Buildings on-site

Unstable highwalls, pits, trenches, slopes: Yes X, No , Number 1,
types and locations: Undercut on WR-4 is steep and a hazardous
highwall.

Unstable waste piles, impoundments, undercut banks: Yes X, No ,
Number 1, types and locations: WR-4 has been undercut for fill
material. WR-1 and -4 are at angle of repose.

Fire and/or Explosion hazards: Yes , No X, Explain:

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the True Fissure site, Prepared by Northern Engineering and Testing, September 2, 1987.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Map, Philipsburg, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

TRUE FISSURE
PA NO. 20-111

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-111-WR-1	74	86.3	3.6	3	6.1	43.4 J	6960	0.244	34900	142 J	347 J	8 J	2420	NR
20-111-WR-2	502	227	2.3	6.2	4.4	43.7 J	37800	1.88	342	2 U	1140 J	5 J	1730	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		TOTAL ACID BASE		NEUTRAL. ACID BASE		SULFUR POTENT.		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR ACID BASE		SULFUR POTENT.	
	%	u/1000t	%	u/1000t	%	u/1000t	%	u/1000t	%	u/1000t	%	u/1000t	%	u/1000t	%	u/1000t	%	u/1000t	%	u/1000t
20-111-WR-1	0.34	10.6	0.34	595	0.44	584	<0.01	584	0.34	13.7	0.34	581	0.44	13.7	0.34	581	0.44	13.7	0.34	581
20-111-WR-2	0.75	23.4	0.75	1.44	0.04	-22	0.57	-22	0.04	1.25	0.14	0.19	0.04	1.25	0.14	0.19	0.04	1.25	0.14	0.19

LEGEND

WR1 - Composite of subsamples WR1A through 1C, 4A, and 4B.
WR2 - Composite of subsamples WR2A and 3A.
BACKGROUND - From the Granite Mountain Mine (20-110-SS-1)

XRF ANALYSIS RESULTS

**TRUE FISSURE
PA NO. 20-111**

XRF Field Analyses

12

\$ - Unvalidated Data

**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**TRUE FISSURE
PA NO. 20-111**

AIMSS SCORESHEET

SITE NAME:
PA NUMBER:

TRUE FISSURE
20-111

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	20.715
6		WELLS - 1 MI. x 2.5		17.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		58
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	85.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	708453
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		10
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	200
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	200
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	22.252
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	97909
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	300
27		LIKELIHOOD SCORE	LINES 25 + 26C	300
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.742
29		POPULATION - 4 MILES		1000
30		NEAREST RESIDENCE		10
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	1025
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	228165
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		250
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	650
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.691
40	DIRECT CONTACT	POPULATION - 1 MILE		30
41	TARGETS	NEAREST RESIDENCE		10
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 - 42	50
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	22458
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			
	(LINES 10 + 24 + 35 + 44) / 100,000			10.57

LINE
NO.

SITE NAME:

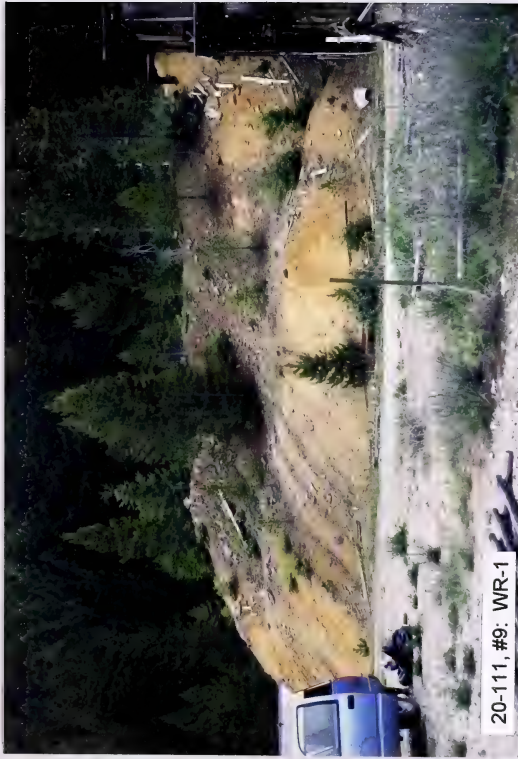
TRUE FISSURE

PA NUMBER:

20-111

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	255
9		POPULATION - 1 MILE		30
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 - 11	50
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	255.00



20-111, #9: WR-1



20-111, #10: WR-3



20-111, #11: Shaft (HMO)



20-111, #12: WR-1



MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: NONPAREIL PA#: 20-012

Date: September 8, 1993 Time: 1100

Field Team Leader: M. Babits, Pioneer

Sampling Personnel: S. Babits, Pioneer
Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Warm (65°F); clear; slight breeze (0-5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): Photos taken were misplaced. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Cap and revegetate tailings ponds.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): NONPAREIL PA#: 20-012

Legal Description: T 8N ; R 12W ; Sec. 32 , SW 1/4 SW 1/4 1/4

County: GRANITE Mining District: SOUTH BOULDER

Latitude: N 46° 23' 53" Longitude: W 113° 08' 02"

Primary Drainage Basin and Code: Flint Creek/17010202

Secondary Drainage Basin: Boulder Creek

USGS Quadrangle map name(s): Maxville

Mine Type/Commodities: Hardrock/Lead, Silver, Zinc, Copper

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): David Murphy,
4501 Eastside Calpella Road, Ukiah, CA 95482. (707) 485-8568;
Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Many
mines in the area.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 6000' , Slope 20° ,
Aspect Northwest, tailings; West, waste rock

Land use: Mining , Recreational X , Residential , Urban ,
Agricultural , Other (Specify)

Area of disturbed/unvegetated lands? 1 acres.
Dimensions:

Predominant vegetation types: Spotted knapweed, fir, mullen,
thistle

Access: roads - good X , poor , 4wd , trail .
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MAMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Boulder Creek flows south to north
approx. 200 feet (sometimes less) to the west of the tailings.
Boulder Creek flows into Flint Creek approx. 5 miles downstream of
the site. Royal Gold Creek flows east to west approx. 200 feet to
the north of the waste rock. Royal Gold Creek flows into Boulder
Creek 1,000 feet downstream of the waste rock.

Mining/milling history, ore type/tenor, host rock, gangue: Mine
was discovered in 1886 and worked actively from 1891 to 1893.
Shipment in 1907 averaged 37 oz. Ag, 13% Zn, 8% Pb, and 1.7% Cu.
Country rock is limestone with brecciation and a disturbed zone of
iron-stained limestones and abundant soft clay containing nodules
of galena and lead carbonate.

Mine Operation?

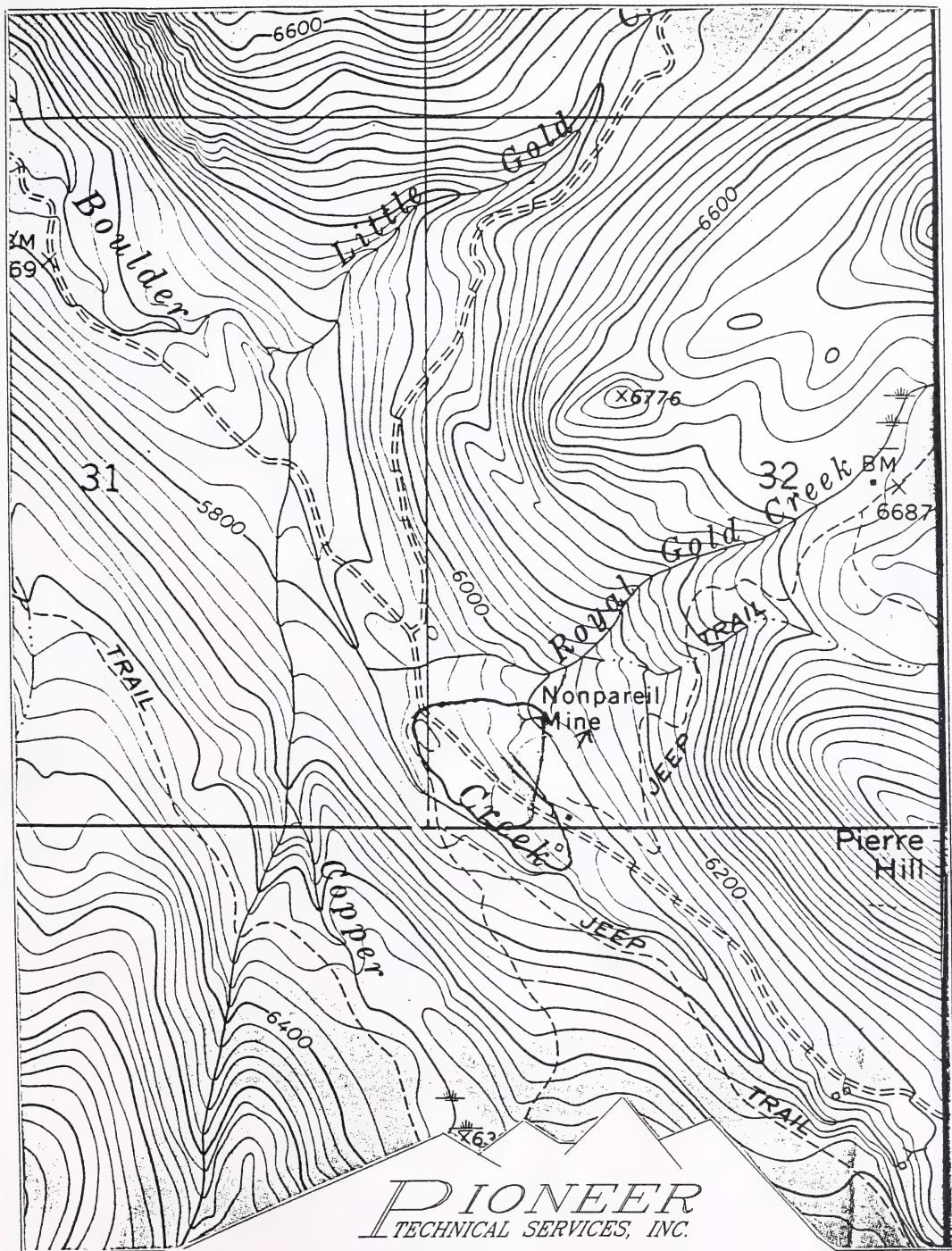
Shafts - Yes X, No , # 1, Comment Caved
Adits - Yes X, No , # 1, Comment Caved
Pits - Yes X, No , # 1, Comment
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes X, No . If yes answer the next three
questions:

Period(s) of Operation: Unknown

Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
Possibly CN- leach (vat); vats were found on the site.



PIONEER
TECHNICAL SERVICES, INC.

NONPAREIL, P.A. NO. 20-012

T08N, R12W, SECTION 32

SCALE: 1" = 1000'



LEGEND

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
Q	UTILITY POLE	⊠	OPEN SHAFT
●	DECIDUOUS TREE	⊠	COLLAPSED SHAFT
*	CONIFEROUS TREE	⊠	EXCAVATION
—	WOOD FENCE	⊠	WASTE ROCK DUMP
—	WIRE FENCE	⊠	COLLAPSED TIMBERS
⊠	BUILDING	—	RAILS
o	BARRIER POST	⊕	XRF SAMPLE
∠	GATE	⊕	WATER SAMPLE GROUND AND SURFACE
---	EDGE OF ASPHALT	—	DRAINAGE
---	EDGE OF GRAVEL	●	WATER WELL
▼	SLOPE DIRECTION	—	PONDED WATER
⊠	TAILINGS POND	—	VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

NONPAREIL PA# 20-012
SOUTH BOULDER DISTRICT GRANITE COUNTY

PIONEER
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPOKANE

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL
SPOKANE

DRAWN: JTP DATE: 01/11/05
DESIGNED: JTP JOB NO.: 20-012
APPROVED: WJB F.B. NO.:
WJB

PLOT SCALE: 1" = 100'

PT340702.DWG SHEETS

1

SHEET NO.

1

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Clay to sand and gravels _____

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): TP-1, 1 foot; TP-2, 4 inches; TP-3, 8 inches; TP-4, pile; TP-5, 4 feet.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Moist

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Flow gates open on all impoundments.

Comments on potential for mitigation: Remove tailings or cap and revegetate.

SOURCE INVENTORY FORM

SAMPLERS: S. Babits, Pierson

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd.)	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
TP-1	TAIL	215	Center of pond; 0'-1', clay	None	< 3.5 (D)	0.04	20-012-TP-1	09/08/93 1550	T-Metals, ABA, CN
TP-2	TAIL	65	Near berm; 0-4"	None	4.5 (D)	0.04			
TP-3	TAIL	45	Center of pond; 0-8"	None	5.8 (D)	0.04			
TP-4A	TAIL	150	Near berm; 0-4"	None	< 3.5 (D)	0.04			
TP-4B	TAIL		From pile in center of pond	None	4.5 (D)	0.04			
TP-5A	TAIL	17,525	Northwest 1/4 of pond; 0'-3', tan/brown medium-grained sand	None	< 3.5 (D)	0.03	20-012-TP-2	09/08/93 1600	T-Metals, ABA, CN
TP-5B	TAIL		Northwest 1/4 of pond; 3'-4', gray wet sand	None	4.6 (D)	0.03			
WR-1A	WR	3,200	Top of pile	None	4.6 (D)	0.03	20-012-WR-1	09/08/93 1525	T-Metals, ABA
WR-1B	WR		West side of pile	None	6.2 (D)	0.03			

* Direct reading (slurry method); B Reluctant (vacuum filter)

Comments or deviations from SOPs: 20-012-TP-1 is composite of TP-1 through -3, and TP-4A and -4B. 20-012-TP-2 is composite of TP-5A and -5B. 20-012-WR-1 is composite of WR-1A and -1B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X, Number:___ Identification:___

Filled shafts: Yes___, No X, Number:___ Identification:___

Seeps/Springs: Yes X, No___, Number: 2 Identification: Near TP-5

Groundwater wells within 4 miles?: Yes X, No___;

Number of well logs: 48

Distance to nearest well used for drinking? 1.25 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite___, Probable___, Possible X, Unlikely___.

Uncontained sources; waste rock with very high iron values, as well as other elevated metal values. Tailings also have elevated metals.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Boulder Creek and Royal Gold Creek

Dry streambeds: Yes X, No , Name(s): Drainage connecting to the tailings

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): Waste rock and tailings

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 30 cfs (Boulder Creek)
High Flow: 300 cfs, Average Flow: 30 cfs

Distance between waste source(s) and nearest surface water body (ft)? 200 feet

Surface water draining onto or through waste sources: Yes X, No ,
Describe: Spring around TP-4 flows onto TP-5 and exits into a pond.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, irrigation, agriculture, wetlands, T&E - Bald Eagle

Observed erosional/sedimentation/stream turbidity problems? Yes ,
No X, Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): None observed at the time of this investigation.

SAMPLERS: M. Babits

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO₃)
Presence of evaporative salt deposits? (ESD)
Discolored or turbid seepage? (SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?
Presence of ferric hydroxide precipitates? (FEOX)
Presence of burned or stressed vegetation? (VEG)
pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 20 acres

Wetlands present: Yes X, No , Describe: Marsh areas

Carbonate rocks/soils: Yes X, No , Describe: Limestone

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ; 10-30 X; 30-100 ;
100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or
greater ; Comments

Nearest residence(ft or miles)? 1.25 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: M. Babits, S. Babits, Pierson

SOURCE I.D. NO.	ACID NINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
TP-1	SO ₃ , pH	Moist	2,925	2,925	Yes	Moderate
TP-2	pH	Moist	3,420	3,420	Yes	Moderate
TP-3	pH	Moist	1,530	1,530	Yes	Moderate
TP-4	pH	Moist	8,460	8,460	Yes	Moderate
TP-5	pH	Moist	78,300	78,300	Yes	Moderate
WR-1	FE ₂ O ₃ , pH	Moist	3,870	3,870	Yes	Moderate

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X,
Describe:

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments None

Evidence of recreational use on site: Yes X, No , Describe: Beer cans

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes ☐, No ☒, Comment _____
 Wilderness Area - Yes ☐, No ☒, Comment _____
 T&E Species Habitat - Yes ☒, No ☐, Comment Bald Eagle
 Bat Habitat - Yes ☐, No ☒, Comment _____

Primary Drainage ; Secondary Drainage X ; No Information :

Riparian Habitat Quality - High___, Medium X, Low___
Wetlands Frontage - High___, Medium X, Low___
Fisheries Habitat and Species Classification - 3
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes , No X , Number , types and locations:

Hazardous structures: Yes X, No , Number 4, types and locations: One mill building (very skewed); three cabins

Unstable highwalls, pits, trenches, slopes: Yes X, No , Number ,
types and locations: Highwall at WR-1

Unstable waste piles, impoundments, undercut banks: Yes____, No X,
Number _____, types and locations:

Fire and/or Explosion hazards: Yes X, No , Explain: Wood mill and
cabins

Bibliography

MBMG, Mineral Industry File 90.0, Nonpareil Mine, Granite County.

MBMG, Sampling and Analysis Plan and Analytical Data for Nonpareil, Provided by Ted Duaime, Date Unknown.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB, Abandoned Mine Reclamation Inventory Field Form for the Nonpareil, Prepared by Northern Engineering and Testing, June 25, 1987.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle, Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Map, Maxville, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

NONPAREIL
PA NO. 20-012

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-012-SE-1	54.1	28.9 J	4.6	3.37 J	3.23	42.7 J	7660	0.751	195 J	6.97	97.2	6.1 UJ	1020	NR
20-012-SE-2	177	139 J	7.9	5.76 J	5.57	69.8 J	18400	0.719	702 J	11.7	754	42.5 J	1390	NR
20-012-TP-1	360	433 J	23.1	1.64 U	2.16	159 J	14900	1.22	9.66 J	2.13 U	3110	282 J	3260	0.395
20-012-TP-2	697	319 J	45.8	8.89 J	4.09	316 J	29700	0.169	198 J	42.4	2640	243 J	12100	0.541
20-012-WR-1	2330	111 J	0.5 U	2.02 J	12.8	863 J	176000	1.78	119 J	5.85	5720	116 J	3310	NR
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. 1/1000x	SULFUR ACID BASE POTENT. 1/1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. 1/1000x
20-012-TP-1	0.84	26.2	1.51	-24.	0.63	0.06	1.87
20-012-TP-2	2.65	82.8	11.7	-71.	0.6	1.76	55
20-012-WR-1	0.53	16.6	-0.2	-16.	0.02	<0.01	0

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-012-SW-1	1.79	15.1	4.27 J	9.7 U	6.83 U	2.9 J	48.2	0.12 UJX	4.08 U	15.1 JX	3.73	30.7 U	16.9 J	76.3
20-012-SW-2	2.86	21	2.57 U	9.7 U	6.83 U	8.87 J	75.3	0.13 JX	4.13	12.7 UJX	7	30.7 U	37.1 J	80.6
20-012-SW-3	5.13	32.6	2.57 U	9.7 U	6.83 U	9.4 J	99.4	0.12 UJX	4.13	12.7 UJX	6.69	30.7 U	67.2 J	93.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N CYANIDE
20-012-SW-1	130	< 5.0	< 5.0	< 0.05
20-012-SW-2	144	< 5.0	< 5.0	< 0.05
20-012-SW-3	155	< 5.0	9	< 0.05

LEGEND

- SE1 - Upgradient (100' from mill building in Boulder Creek.
Just upgradient of pump house.
SE2 - At PPE of pond discharge to Boulder Creek.
TP1 - Composite of subsamples TP1, TP2, TP3, TP4A, and 4B.
TP2 - Composite of subsamples TP5A and TP5B.
WR1 - Composite of subsamples WR1A and WR1B.
BACKGROUND - From Jackson Park (20-07-SS-1).
- SW1 - Same as SE1.
SW2 - Same as SE2.
SW3 - Pond below Tailings Pond 5.
(discharges into Boulder Creek)

XRF ANALYSIS RESULTS

**NONPAREIL
PA NO. 20-012**

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-012-TP1-A		8696.61	5452.22	2327.3		284.013 *	3259.63			3355.47		73.3133
20-012-TP1-A-DUP			5167.56	2341.69			3264.83			3440.51		70.2764
20-012-TP4-A			4729.28	2218.04		279.05 *	23670.8		111.851 *	3914.48	274.219 *	172.724
20-012-TP4-B			2047.34	2047.34			9592.83			1061.92		210.478
20-012-TP5-A			2749.1	368.284 *			22900.2		230.706	740.983		31.6134
20-012-TP5-B			7988.03	1202.27		480.809 *	19775.5		122.324 *	13492.5	449.386	88.2415
20-012-TP-1-COMP			7767.69	2759.03			12653.1		97.1891 *	2078		144.977
20-012-TP-2			4331.29	2401.19			25099.7		118.75 *	1533.59	232.205 *	162.411
20-012-TP-2-COMP			7502.04	1480.73		335.843 *	20256.2		171.331 *	7492.48	235.486 *	93.8285
20-012-TP-3			9695.42	2379.41		272.018 *	18517.3		122.822 *	1386.96		174.118
20-012-WR1-A			1540.33	286.735 *			304309		744.304	1783.86	4205.19	39.4731 *
20-012-WR1-B			2901.18	308.309 *		546.779 *	239816		565.398	6255.09	2397.25	31.7443 *
20-012-WR-1-COMP			2069.49	376.464 *			310892		898.97	4238.44	3739.67	47.0414
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
20-012-TP1-A	97.9252			1585.53	57.797		338.339	960.781	123.771 *	12.4066 *		
20-012-TP1-A-DUP	88.4972			1520.33	59.9681		338.739	896.78			12.9279 *	
20-012-TP4-A	145.803		6.75467 *	2777.06	122.042		470.478	944.915	146.786 *		15.1779 *	
20-012-TP4-B	139.247		7.45681 *	1402.21	123.149		318.946	1087.04	104.494 *		9.59124 *	
20-012-TP5-A	78.5181			3367.57	37.6147		1232.15	313.5			34.8416 *	
20-012-TP5-B	73.9457		5.8023 *	673.007	58.4823		130.312 *	868.876	131.46 *		9.25896 *	
20-012-TP-1-COMP	139.908		7.26027 *	2167.8	95.7399		474.82	868.93	126.476 *		10.8642 *	
20-012-TP-2	145.127		8.24562 *	4271.04	127.761		728.222	1056.34	172.867 *		23.8871 *	
20-012-TP-2-COMP	82.5324		5.80531 *	1778.22	49.7234		628.868	685.527	108.248 *			
20-012-TP-3	146.748		10.7055 *	3324.23	119.465		870.384	1027.14	229.214 *		14.19 *	
20-012-WR1-A	30.0211 *		18.4875 *	7506.17			509.931	178.337	265.877 *			
20-012-WR1-B	27.2684			743.707			255.51 *	233.234	254.505 *			
20-012-WR-1-COMP	40.1288		11.1847 *	6663.46		339.612 *	384.936 *	228.202				

* - Estimated Quantity
\$ - Unvalidated Data

**ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET**

**NONPAREIL
PA NO. 20-012**

AIMSS SCORESHEET

SITE NAME:

NONPAREIL

PA NUMBER:

20-012

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	26.524
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		48
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	48.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	509261
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	340
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	28.913
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	27
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	265421
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		0
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	0
27		LIKELIHOOD SCORE	LINES 25 + 26C	0
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.879
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	25
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	0
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		0
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	0
38		LIKELIHOOD SCORE	LINES 36 + 37C	50
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.811
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 - 42	5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	203
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			7.75
	(LINES 10 + 24 + 35 + 44) / 100,000			

LINE NO.			SITE NAME:	NONPAREIL
			PA NUMBER:	20-012
		SITE SAFETY		
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	160
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	235
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	5
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	23.50

**SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES**

NonPARCEL

LAB ID SAMPLE ID Cr Crq Ni Nic Niq Cu Cuc Cuq Zn Znc Znq As Asc Asq Ag Agc Agq

DISSOLVED METALS: (ppb)

92Q881	FNPS10M	0.00	U	0.00	U	3.78	B	20.04	B	4.91	B	0.00	U
92Q882	FNPS20M	0.00	U	0.00	U	0.00	U	36.52	B	1.76	B	0.00	U
92Q883	FNPS30M	0.00	U	0.00	U	3.29	B	42.82	B	5.30	B	0.00	U
92Q887	FNPS40L	-1.34	U	0.14	U	2.22	U	20.68	U	0.89	U	-1.12	U
92Q888	FNPS50L	-1.42	U	0.06	U	1.91	U	55.58	U	0.67	U	-1.11	U
92Q880	FNPS60L	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U

TOTAL RECOVERABLE METALS: (ppb)

92Q974	FNPS40L	0.00	U	0.00	U	2.82	B	31.96	B	0.00	B	0.00	U
92Q975	FNPS50L	0.00	U	0.00	U	0.00	U	16.54	B	2.70	B	0.00	U

TOTAL METALS: (ppm)

92S889	FNPD10H	3.62	B	0.52	U	319.91	N	16561.08	N	445.26	N	70.23	U
92S890	FNPD20H	0.00	U	0.00	U	1.72	U	1.94	U	0.00	U	0.00	U

B AND H MINE

DISSOLVED METALS: (ppb)

92Q1471	JBHS10M	-1.50	U	0.53	U	1.44	U	5.15	U	-0.26	U	-1.14	U
92Q1473	JBHS20L	-1.35	U	0.20	U	0.61	U	37.91	U	-0.13	U	-0.97	U

TOTAL RECOVERABLE METALS: (ppb)

92Q1472	JBHS10M	0.00	U	0.00	U	0.00	U	5.68	B	1.94	B	0.00	U
92Q1474	JBHS20L	0.00	U	0.00	U	0.00	U	4.48	U	1.77	B	0.00	U

TOTAL METALS: (ppm)

92S1475	JBHD10M	22.95	U	12.15	B	291.82	N	263.00	N	120.22	N	8.24	B
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QUEEN MINE

DISSOLVED METALS: (ppb)

92Q898	BQNS10L	-1.32	U	-0.34	U	2.00	U	14.91	B	0.47	U	-1.14	U
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LITTLE QUEEN MINE

Nonparel

LAB ID SAMPLE ID Cd Cdc Cdq Ba Bac Baq Pb Pbc Pbq Hg Hgc Hgq

DISSOLVED METALS: (ppb)

92Q881	FNPS10M	0.00	U	35.34	B	2.82	B			
92Q882	FNPS20M	0.60	B	29.25	B	3.88	B			
92Q883	FNPS30M	0.80	B	43.71	B	5.76	B			
92Q887	FNPS40L	-0.68	U	23.66	B	3.66				
92Q888	FNPS50L	-0.74	U	20.91	B	-0.77	U			
92Q880	FNPS60L	0.00	U	0.00	U	0.00	U			

TOTAL RECOVERABLE METALS: (ppb)

92Q974	FNPS40L	0.00	U	26.27	B	45.97		0.07	B	
92Q975	FNPS50L	0.00	U	20.38	B	0.00	U	0.09	B	

TOTAL METALS: (ppm)

92S889	FNPD10H	111.83		627.33		4949.94		194.75		
92S890	FNPD20H	0.00	U	0.00	U	0.00	U	0.11	B	

B AND H MINE

DISSOLVED METALS: (ppb)

92Q1471	JBHS10M	1.96	B	19.58	B	-0.59	U			
92Q1473	JBHS20L	0.82	U	19.89	B	-0.92	U			

TOTAL RECOVERABLE METALS: (ppb)

92Q1472	JBHS10M	0.00	U	16.89	B	0.00	U	0.09	B	
92Q1474	JBHS20L	0.00	U	16.93	B	0.00	U	0.09	B	

TOTAL METALS: (ppm)

92S1475	JBHD10M	1.82	B	83.92	B	649.93		N	2.87	
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QUEEN MINE

DISSOLVED METALS: (ppb)

92Q898	BQNS10L	-0.83	U	0.86	U	0.28	U			
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LITTLE QUEEN MINE

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: BROOKLYN PA#: 20-025

Date: June 24, 1993 Time: 0900

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Overcast; cool; calm; cool, wet
spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #31: Adit #3; #32:
WR-2; #33: WR-1, just above WR-2; #34: SW-1 and SE-1 location
downgradient of WR-6 and WR-5, also downgradient of intermittent
drainage WR-3; #35: SW-2 and SE-2 30 feet upstream of water
generator building, adits, and dumps; #36: Adit #2 at bottom with
WR-5 and WR-6, north end may have been a collapsed adit.
Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms): No
mill structure was identified on the site, though tailings were
identified in a previous investigation. Two dam (small) structures
are present forming two small ponds (dry). However, because of the
lack of a mill, the tailings could be waste rock fines that were
washing away from the waste rock dumps above. A trail of fines
does lead from the waste rock piles to the ponds.
Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Isolate waste
material from Boulder Creek; feasibility study of remedial
alternatives probably necessary. Grade, amend, and revegetate
upper waste rock dumps and settling ponds. Close HMO.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BROOKLYN PA#: 20-025

Legal Description: T 7N ;R 12W ;Sec. 5 , SE1/4 NW1/4 1/4

County: GRANITE Mining District: SOUTH BOULDER

Latitude: N 46° 23' 23" Longitude: W 113° 07' 30"

Primary Drainage Basin and Code: Flint Creek/17010202

Secondary Drainage Basin: Boulder Creek

USGS Quadrangle map name(s): Maxsville/Pikes Peak

Mine Type/Commodities: Hardrock/Silver, Copper, Lead, Zinc, Bismuth

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Deerlodge National Forest

Relationship to other mines/sites in the area/district: Unknown; possible connection to the Nonpareil site.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 6280' , Slope 15° , Aspect Southwest

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ , Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 2.5 acres.
Dimensions:

Predominant vegetation types: Lodgepole pine, Douglas fir

Access: roads - good ☐ , poor ☐ , 4wd ☒ , trail ☐ .
Other logistical considerations (proximity to other sites).
Located past the Nonpareil mine.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach
MDMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also
note presence of radioactive minerals). Lower half of the site lies directly on
perennial Boulder Creek, which flows northwest past the site. The
upper half of the site shows an intermittent drainage (dry during
this investigation) draining to Boulder Creek. Waste rock dumps
contained limestone, quartz, dike material and another intrusive.

Mining/milling history, ore type/tenor, host rock, gangue: No
information available.

Mine Operation?

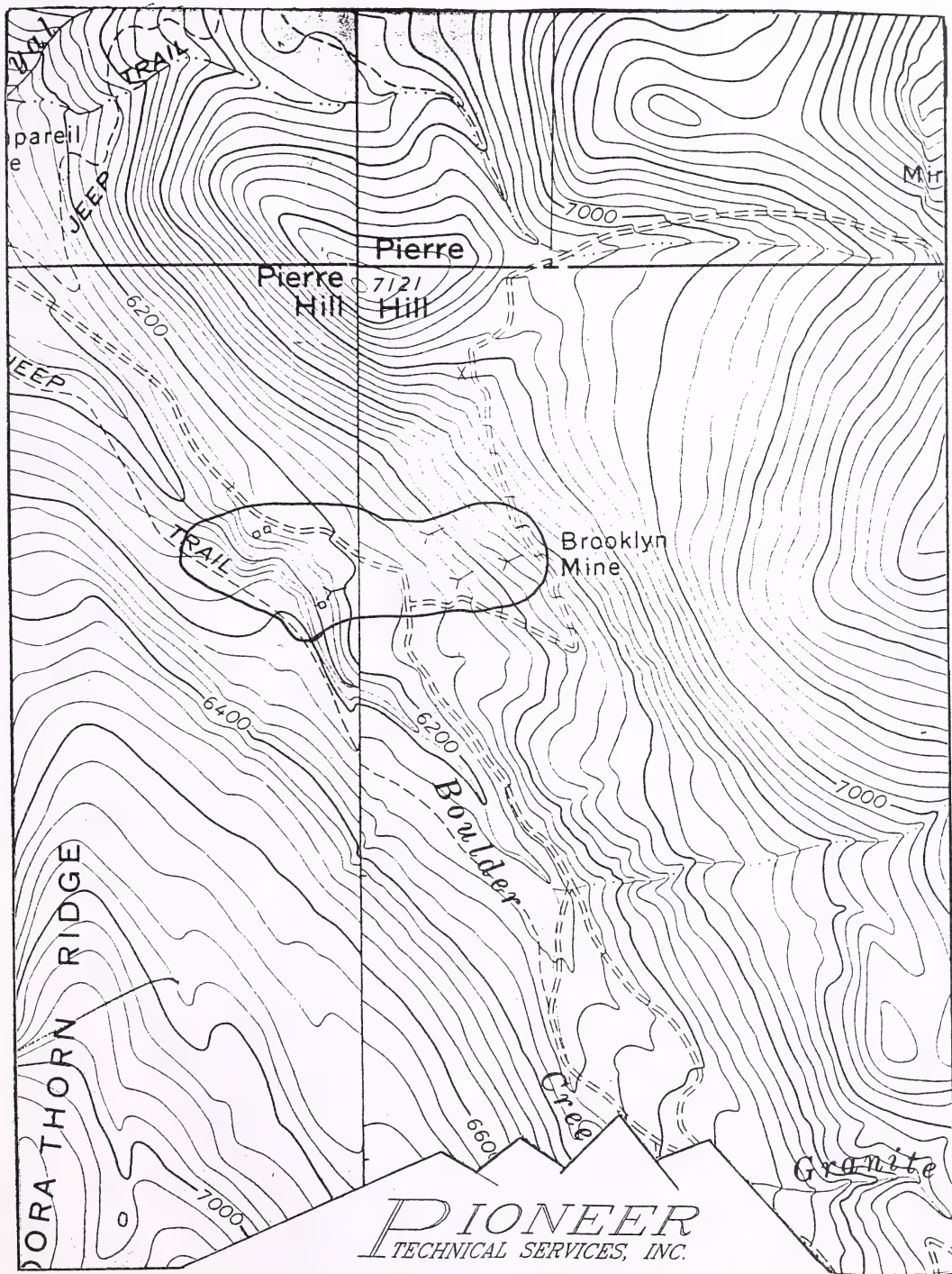
Shafts - Yes , No X, # , Comment
Adits - Yes X, No , # 4, Comment 3 collapsed; 1 closed
Pits - Yes X, No , # 1, Comment Above WR-1
Placers - Yes , No X, # , Comment
Other - Yes , No X, # , Comment

Mill Operation? Yes , No X. If yes answer the next three
questions:

Period(s) of Operation: Tailings may be present, but more likely,
pile is contained waste rock.

Origin of Ore Milled - Custom Mill Dedicated Mill ; Number and
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?
N/A



PIONEER
TECHNICAL SERVICES, INC.

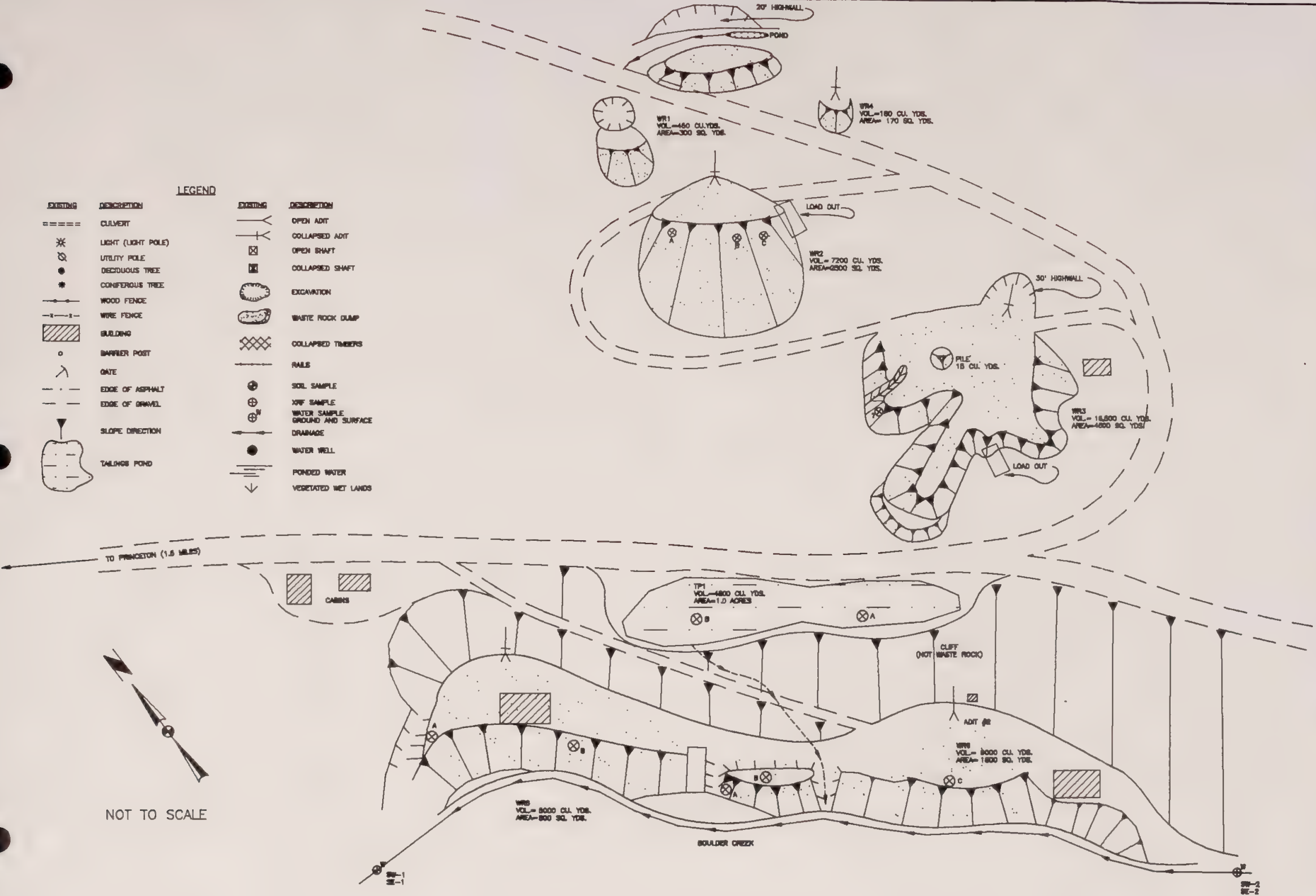
BROOKLYN, P.A. NO. 20-025

T07N, R12W, SECTION 05

SCALE: 1' = 1000'

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
=====	CULVERT	---	OPEN ADIT
✱	LIGHT (LIGHT POLE)	---X---	COLLAPSED ADIT
●	UTILITY POLE	⊠	OPEN SHAFT
●	DECIDUOUS TREE	⊠	COLLAPSED SHAFT
●	CONIFEROUS TREE	⬭	EXCAVATION
—●—	WOOD FENCE	⬭	WASTE ROCK DUMP
—X—	WIRE FENCE	⬭	COLLAPSED TIMBERS
▨	BUILDING	---	RAILS
○	BARRIER POST	⊙	SOIL SAMPLE
⌒	GATE	⊙	XRF SAMPLE
---	EDGE OF ASPHALT	⊙	WATER SAMPLE
---	EDGE OF GRAVEL	⊙	GROUND AND SURFACE
▲	SLOPE DIRECTION	---	DRAINAGE
⬭	TAILINGS POND	●	WATER WELL
		---	PONDED WATER
		↓	VEGETATED WET LANDS

LEGEND



PIONEER ENGINEERING CONSULTANTS GREAT FALLS-BOZEMAN-KALISPELL SPOKANE	DRAWN: JTP DESIGNED: TPR APPROVED: KJB DATE: 12 OCT 93 JOB NO: 93-17 F.B. NO.	THOMAS, DEAN & HOSKINS INC. ENGINEERING CONSULTANTS MONTANA WASHINGTON
	MONTANA DEPT. OF STATE LANDS HAZARDOUS MATERIAL INVENTORY BROOKLYN PA# 20-025 SOUTH BOULDER DISTRICT GRANITE COUNTY	

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): _____
Possible tailings contain silt to medium sand. _____

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): 3 feet maximum depth

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Moist

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Breached

Comments on potential for mitigation: Containment or revegetation

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Flammanq, Lasher*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd')	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1	WR	450	WR-1 above WR-2 hole 7 feet off knob	None	6.45 (D)	0.03	20-025-WR-2	06/24/93 2010	T-Metals, ABA
WR-2A	WR	7,200	Hole furthest north	None	3.5 (D)	0.03			
WR-2B	WR		Northeast of WR-1, south of WR-2A	None	3.75 (D)	0.04			
WR-2C	WR		Hole furthest south	None	3.5 (D)	0.035			
WR-3A	WR	16,500	In front of collapsed cabin	None	5.1 (D)	0.045	20-025-WR-3	06/24/93 2010	T-Metals, ABA
WR-3B	WR		20' from edge of collapsed load out	None	4.8 (D)	0.025			
WR-3C	WR		Off knob of largest lobe	None	< 3.5 (D)	0.03			
WR-3D	WR		On side of small lobe west of main lobe	None	< 3.5 (D)	0.03			
WR-4	WR	180	Small dump south of mine site	None	4.8 (D)	0.03			
WR-5A	WR	5,000	Dump furthest downstream lower level, hole furthest downgradient	None	5.25 (D)	0.05	20-025-WR-5	06/24/93 2045	T-Metals, ABA
WR-5B	WR		Just upstream of collapsed log structure, 35 feet from loadout	None	5.0 (D)	0.04			
WR-6A	WR	9,000	25' southeast of loadout	None	3.85 (D)	0.05			
WR-6B	WR		Approx. 25 feet from WR-6A on top of dump	None	6.1 (D)	0.05			
WR-6C	WR		Approx. 10' northwest of closed adit	None	5.6 (D)	0.035			

*Direct reading (Alpha Meter); Substantiated Beta/Gamma Meter

Comments or deviations from SOPs: 20-025-WR-2 is composite of WR-1 and WR-2A through -2C.
20-025-WR-3 is composite of WR-3A through -3D. 20-025-WR-5 is composite of WR-5A and -5B, and WR-6A through -6C.

*Continued on next page

SAMPLERS: Bullock, Flammang, Lasher

D-Direct reading (Kelway Meter); S-Saturated Paste (Orion Meter)

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes , No X, Number: Identification:

Filled shafts: Yes , No X, Number: Identification:

Seeps/Springs: Yes X, No , Number: 1 Identification: Small Seeps
into Boulder Creek from WR-5

Groundwater wells within 4 miles?: Yes X, No ;
Number of well logs: 11

Distance to nearest well used for drinking? 2.8 miles to the town of
Princeton

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite , Probable X, Possible , Unlikely .

Seeps from toe of WR-5 and WR-6 are directly into Boulder Creek which is
causing some iron staining.

Other observations/notes: N/A

SAMPLERS:

[illegible]

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map of topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No , Name(s): Boulder Creek

Dry streambeds: Yes X, No , Name(s): Intermittent runoff drain-
ages on or near several of the dumps

Other surface water: Yes , No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No Source ID(s): WR-5 and WR-6

Approximate Flood frequency? X 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? 75 cfs during investigation
High Flow: 200 cfs, Average Flow: 20 cfs

Distance between waste source(s) and nearest surface water body (ft)?
0 feet; toes of WR-5 and WR-6 in Boulder Creek.

Surface water draining onto or through waste sources: Yes X, No ,
Describe: The base of WR-5 and WR-6 is in contact with Boulder Creek.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, drinking water, wetlands, T&E (Bald Eagle), irrigation, agriculture

Observed erosional/sedimentation/stream turbidity problems? Yes X,
No , Distance downstream (ft)? N/A Describe/explain (Note streambank
stability and condition of streambank vegetation and any manmade structures or channel changes present): WR-5
and WR-6 are deposited in stream along with a lot of other debris.
Runoff from WR-3 and possible tailings pond enters stream between WR-5
and WR-6. Visual impacts to the stream limited to the bounds of the
site.

SAMPLERS: Bullock

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO ₃)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres above; 1/2 acre at lower dumps WR-5 and WR-6

Wetlands present: Yes X, No , Describe: 1/2 mile downstream; approx. 10 acres

Carbonate rocks/soils: Yes X, No , Describe: Limestone is abundant.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X; 10-30 ; 30-100 ; 100-300 ; 300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ; Comments

Nearest residence(ft or miles)? 2.8 miles

For each source (table next page):

Available fine materials?	Surface area?
Uncovered and unvegetated?	Wet or dry?
Overall dust propagation potential:	
observed	high
	moderate
	low
	none

SAMPLERS: Bullock, Flammang, Lasher
ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LEFT)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/FINE/NO CRUSTE/LOW/NONE)
WR-1	None	Dry	2,700	2,700	Yes	Low - crust
WR-2	pH	Dry	22,500	22,500	Yes	Low - crust
WR-3	SO ₃ ; pH	Dry	40,500	40,500	Yes	Low - crust
WR-4	pH	Dry	1,500	1,000	Yes	Low - crust
WR-5	Seeps from below; dump shows FEOX	Partial	7,200	7,200	Yes	Low - crust
WR-6	Seeps from below; dump shows FEOX	Partial	16,200	16,200	Yes	Low - crust
TP-1	pH	Dry	40,000	32,000	Yes	Low - crust

Notes and Clarifications: _____

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes , No X,
Describe:

Population within 1 mile: 1-10 ; 10-30 ; 30-100 ; 100-300 ;
300-1,000 ; 1,000-3,000 ; 3,000-10,000 ; 10,000 or greater ;
Comments No residents within 1 mile.

Evidence of recreational use on site: Yes X, No , Describe: New
claim notices; beer cans; campfire rings

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <u> </u> , No <u>X</u> , Comment <u> </u>
Wilderness Area -	Yes <u> </u> , No <u>X</u> , Comment <u> </u>
T&E Species Habitat -	Yes <u>X</u> , No <u> </u> , Comment <u>Bald Eagle</u>
Bat Habitat -	Yes <u>X</u> , No <u> </u> , Comment <u>Possible</u>

Primary Drainage ; Secondary Drainage X; No Information :

Riparian Habitat Quality - High , Medium X, Low
Wetlands Frontage - High , Medium X, Low
Fisheries Habitat and Species Classification - 3
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No , Number 1, types and locations:
Adit open but currently gated and locked.

Hazardous structures: Yes X, No , Number 7, types and locations:
On WR-2, a hazardous loadout starting to collapse; WR-3 has partially
collapsed cabin and loadout; WR-6 has partially collapsed wood struc-
ture, metal building, loadout, and outhouse on platform on creek.

Unstable highwalls, pits, trenches, slopes: Yes X, No , Number 2,
types and locations: Highwall associated with WR-4; Cut associated with
WR-5.

Unstable waste piles, impoundments, undercut banks: Yes X, No ,
Number 2, types and locations: Slopes on all waste rock are at an
angle of repose; WR-5 and -6 are particularly steep and WR-5 is being
undercut by Boulder Creek.

Fire and/or Explosion hazards: Yes X, No , Explain: Wood structures

Bibliography

- MBMG, Sampling and Analysis Plan and Analytical Data for the Brooklyn Mine, Provided by Ted Duaime, Date Unknown.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Brooklyn, Prepared by Northern Engineering and Testing, June 25, 1987.
- USGS, Topographic Map, Maxville and Pikes Peak, Montana, 7 1/2 minute Quadrangles, 1971.

LABORATORY ANALYTICAL DATA

BROOKLYN
PA NO. 20-025

Brooklyn PA# 20-025
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/24/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-025-SE-1	126	318 J	12.6	1.5	1.4	56.5	8610	1.52 J	42.4 J	8 J	537	63	1560	NR
20-025-SE-2	17	40 J	1.2	3.5	2.6	8	9410	0.099 J	278 J	3 J	32	4 U	179	NR
20-025-TP-1	668	861 J	99.3	3.8	5.7	2290	15900	10.4 J	18.2 J	16 J	5650	747	13500	NR
20-025-WR-2	466	294 J	38.7	3.9	3.5	566	17700	12.6 J	43.9 J	15 J	5510	644	9140	NR
20-025-WR-3	797	227 J	3	6.3	3	121	54300	2.2 J	43.4 J	15 J	2030	64	648	NR
20-025-WR-5	388	435 J	41.4	4.4	2.5	213	17600	20.8 J	45.1 J	80 J	3310	184	3180	NR
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. 1/1000	NEUTRAL POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000
20-025-TP-1	3.29	103	-1.5	-104	1.08	1.25	39	-40.6
20-025-WR-2	1.81	56.5	5.7	-50	1.03	0.29	9.06	-3.36
20-025-WR-3	5.07	158	42.1	-116	1.57	2.62	81.8	-39.7
20-025-WR-5	1.65	51.5	165	114	1.09	0.46	14.4	151

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO ₃ /L)
20-025-SW-1	2.88	13.4	2.57 U	9.7 U	6.83 U	2.33	110	0.067	6.2	12.7 U	9.39	30.7 U	7.57 U	51.5
20-025-SW-2	1.24	10.5	2.57 U	9.7 U	6.83 U	1.55 U	25.5	0.038 U	4.43	12.7 U	0.38 U	30.7 U	7.57 U	51.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N	CYANIDE
20-025-SW-1	95	< 5.0	5	< 0.05	NR
20-025-SW-2	96	< 5.0	5	< 0.05	NR

LEGEND

SE1 - Downgradient of waste rock dump 5 and 6.
SE2 - Upgradient of mine.
TP1 - Composite of subsamples TP1A-A 1A-B, 1B-A, 1B-B, and 1B-C.
WR2 - Composite of subsamples WR1, 2A, 2B, and 2C.
WR3 - Composite of subsamples WR3A, 3B, 3C, and 3D.
WR5 - Composite of subsamples WR5A, 5B, 6A, 6B, and 6C.
BACKGROUND - From the Jackson Park Mine (20-027-SS-1).

SW1 - Same as sample SE1.
SW2 - Same as sample SE2.

XRF ANALYSIS RESULTS

BROOKLYN
PA NO. 20-025

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-025-SS-1		13126.2	11529.3	2799.27	118.454 *	1964.17	25663.1		70.7735 *	153.399 *	70.588 *	332.236
20-025-TP1A-A		35494.3	5140.94	1324.4	147.752 *		6598.65		173.065 *	622.167		193.614
20-025-TP1A-B		15547.9	4236.42	1547.81			10816.2		173.065 *	12498.2		182.276
20-025-TP1A-C		16742.1	4501.93	2712.88			10463.3		684.675	7799.53		284.276
20-025-TP1B-A		14481.1	14669.1	3465.78			13844.3		319.662	662.941	373.905 *	886.007
20-025-TP1B-B		25223.1	3713.72	4605.18			10459.4		3839.13	3995.36		409.195
20-025-TP-1-COMP		14211.2	4095.43	944.935	186.794 *		9943.47		510.505	10161.8		156.662
20-025-WR1-A		8959.47	2599.27	894.045			12213		141.141 *	175.624	165.148 *	442.083
20-025-WR1-A	400.924 *	30068.3	4291.98	2373.89			12958.3		435.101	7722.84		447.284
20-025-WR2-A		23910.6	4446.31	2123.3			4536.4		1911.78	24246.9		86.9647
20-025-WR2-B		13917.5	6503.1	1904.94			7755.92		205.339	2051.32		306.226
20-025-WR3-A		8625.36	4193.98	2524.78			1428.25				51.1241 *	1210.84
20-025-WR3-B		8379.22	2931.1	1102.92			8540.5			240.047		681.238
20-025-WR3-C		20506.9	45270.3	921.196	182.048 *		21621.6			198.096		636.741
20-025-WR3-D		21450.7	17481.9	3962.57			15062.3		78.3207 *	1265.89		228.608
20-025-WR4-A		27775.6	23619.1	2739.22			9068.94			54.9572 *	117.2 *	119.678
20-025-WR5-A	278.15 *	24156.5	2394.04				2165.61		140.103 *	1217.18		1968.99
20-025-WR5-B		22647.3	13784.2				6932.29			1284.62	152.237 *	146.848
20-025-WR6-A		26215.5	1680.04	972.04			8814.81			8096.55		148.181
20-025-WR6-B		20987.2	1757.93	458.012 *			2672.35			83.3196 *	64.5009 *	523.565
20-025-WR6-C		4117.62	106897	565.873	208.67 *		30196.8		240.816	748.262	521.554	248.766
20-025-WR-2-COMP		12006.6	4291.67	1417.28	147.22 *		13941.5		689.383	337.126	161.39 *	314.417
20-025-WR-3-COMP		10775.5	21784.2	1708.14			24869.9				287.322 *	546.379
20-025-WR-5-COMP		14981.1	17585.7	281.361 *			6950.51			2001.42		499.392
Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	U	Th			
20-025-SS-1	135.825			79.3954			927.999					
20-025-TP1A-A	143.724		1879.95	185.457		452.659	1231.37		133.858 *		14.741	
20-025-TP1A-B	88.8243		5023.21	117.387	181.84 *	1544.29	1876.12		253.083 *		44.1446	
20-025-TP1A-C	118.179		3177.16	98.2674		574.871	936.597		125.688 *		30.6393	
20-025-TP1B-A	161.809		4743.48	125.353		2731.39	954.322		294.481		98.5295	
20-025-TP1B-B	178.275		2224.14	145.28		265.717	741.411		96.116 *	19.945 *	31.7499	
20-025-TP-1-COMP	79.677		4662.16	93.8707		1049.85	1202.32		177.958 *		18.7789	
20-025-WR1-A	65.6263		1193.9	61.0153		220.804	132.292		75.2151 *		10.7665	
20-025-WR2-A	171.455		8918.96	196.072	157.145 *	1989.21	672.261		294.381		40.5313	
20-025-WR2-B	161.883		1128.05	170.01		496.321	929.088		154.833 *		9.61122	
20-025-WR2-C	148.045		2899.73	141.142		1001.53	577.429		183.104 *		28.6452	
20-025-WR3-A	387.055		95.1428	60.1793		80.8905 *	518.961			15.4266 *	35.0678	
20-025-WR3-B	87.5567		391.369	68.4532		45.429 *	517.62		84.7602 *		18.4276	
20-025-WR3-C	86.0081		243.593	145.866	122.052 *	200.21	527.726		105.184 *			
20-025-WR3-D	129.606			111.148			205.674		73.886 *	17.3114 *	12.5955	
20-025-WR4-A	196.213		247.799	157.248		214.276	883.042			15.1117	15.1117	
20-025-WR5-A	130.855	65.2876	3922.87	146.213		273.137	241.462		135.213 *		49.7108	
20-025-WR5-B	174.355		610.709	158.567		1099.49	1959.28		118.653 *	12.9775 *	22.7514	
20-025-WR6-A	170.288		3983.06	133.653		123.848 *	1601.15		146.034 *		20.3483	
20-025-WR6-B	124.63	51.618	348.723	103.093		693.419	65.5277 *		65.484 *		11.7241	
20-025-WR6-C	74.4591	54.2536	358.031	43.1319 *			226.52		140.484 *	9.80139 *		
20-025-WR-2-COMP	100.913	38.8251	2988.9	110.155	147.07 *	753.854	540.861		154.755 *		16.0446	
20-025-WR-3-COMP	121.756	6.04216 *	1265.85	73.4098	125.165 *	148.277 *						
20-025-WR-5-COMP	126.248		1554.68	108.327		315.679	790.236		64.1789 *		18.9193	

* - Estimated Quantity
\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

BROOKLYN
PA NO. 20-025

AIMSS SCORESHEET

SITE NAME:

BROOKLYN

PA NUMBER:

20-025

LINE NO.				
GROUNDWATER PATHWAY				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	108.910
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		11
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	11.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	479204
SURFACE WATER PATHWAY				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	118.418
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 - 22	27
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	2238100
AIR PATHWAY				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.230
29		POPULATION - 4 MILES		1
30	AIR - TARGETS	NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 - 33	16
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	1784
DIRECT CONTACT PATHWAY				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.052
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 - 42	5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	1539
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			
	(LINES 10 + 24 + 35 + 44) / 100,000			27.21

LINE
NO.

SITE NAME:
PA NUMBER:

BROOKLYN
20-025

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	280
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	405
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	5
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	40.50

**SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES**

LAB ID	SAMPLE ID	Cr	Cre	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
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BROOKLYN MINE

DISSOLVED METALS: (ppb)

92Q884 BLBS10L

0.00	U	0.00	U	3.22	B	15.43	B	1.41	B	0.00	U
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TOTAL RECOVERABLE METALS: (ppb)

92Q971 BLBS10L

0.00	U	0.00	U	0.00	U	14.29	B	0.00	U	0.00	U
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TOTAL METALS: (ppm)

92S892 BLBD10M

4.38	B	2.27	B	109.97	N	4563.24	N	438.01		50.90	
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LAB ID	SAMPLE ID	Cd	Cdc	Cdd	Ba	Bac	Baq	Pb	Pbc	Pbd	Hg	Hgc	Hgd
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BROOKLYN MINE

DISSOLVED METALS: (ppb)

92Q884	BLBS10L	0.00	U		14.50	B		1.02	B				
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TOTAL RECOVERABLE METALS: (ppb)

92Q871	BLBS10L	0.00	U		13.33	B		0.00	U				
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TOTAL METALS: (ppm)

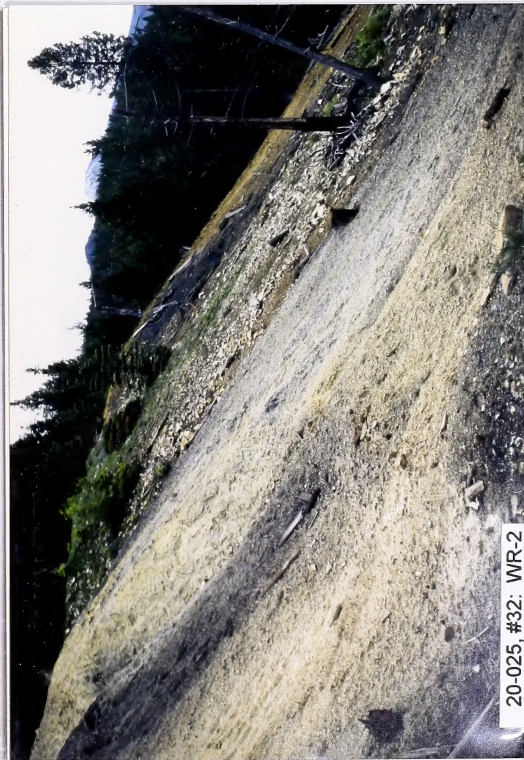
92S892	BLBD10M	33.84			1146.80			3192.93			52.47		
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20-025, #5: Tailings or fine waste rock dam



20-025, #31: Adit #3; collapsed with timbers



20-025, #32: WR-2



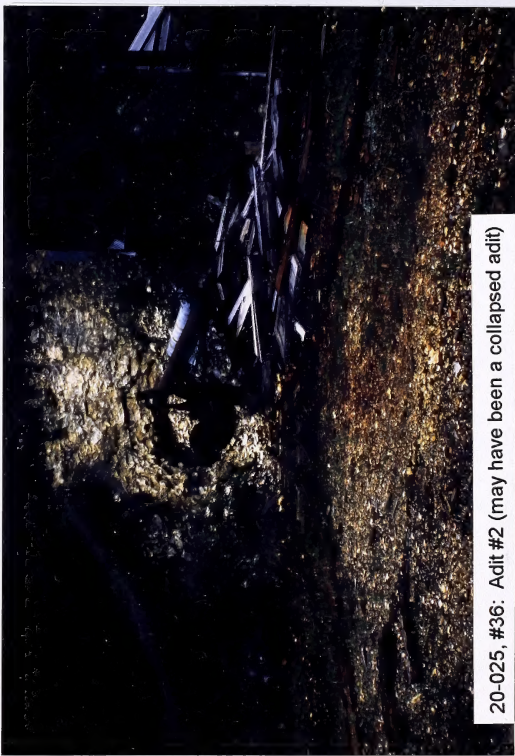
20-025, #33: WR-1 just above WR-2



20-025, #35: SW-2 and SE-2 sample location



20-025, #34: SW-1 and SE-1 sample location



20-025, #36: Adit #2 (may have been a collapsed adit)

